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Y3 N88125/4901

NUREG/CR-4901
LA-10981-MS

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Effects from Influent Boundary Conditions on Tracer Migration and Spatial Variability Features in Intermediate-Scale Experiments

Prepared by H. R. Fuentes, W. L. Polzer, E. P. Springer

Los Alamos National Laboratory

Prepared for
U.S. Nuclear Regulatory
Commission

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Manuscript Completed: March 1987
Date Published: April 1987

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Washington, DC 20555
NRC FIN A7150

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EXECUTIVE SUMMARY

In previous unsaturated transport studies conducted in large caissons at Los Alamos, dispersion coefficients were estimated to be higher close to the tracer source than at greater distances from the source. Injection of tracers through discrete influent outlets could have accounted for those higher dispersions. Also, a lack of conservation of mass of the tracers was observed and may have been due to spatial variability effects. The present study was conducted (1) to compare tracer breakthroughs and parameter estimates between discrete influent and ponded influent applications and (2) to determine spatial variability among locations at the same depth within the tuff.

The present experiment was performed under saturated moisture conditions with a 3-cm head of water at the surface to provide a uniform application of tracers in 0.01 N CaCl_2 solution. The flow rate was maintained at about 200 mL min^{-1} , the same rate at which the unsaturated steady flow experiments were conducted. The pulse length (6 days) was also the same as those of the previous experiments. The tracers, iodide and strontium, were monitored in solutions sampled at four locations across the caisson for four depths (36, 113, 264 and 415 cm). Other measurements included moisture content, Eh, pH, dissolved oxygen, alkalinity, silica, cesium, magnesium, calcium, sodium, potassium, sulfate, chloride, and phosphate. The breakthroughs of tracers were modeled and transport parameters estimated using the optimal parameterization technique of the CFITIM computer code and the method of moments.

The estimated parameters from tracer breakthroughs under discrete influent application compared to those under ponded influent application were found to be different. Under discrete influent application the estimated

dispersion coefficient decreased with depth whereas under ponded influent application the coefficient increased with depth. The dispersion coefficients in the latter case tended to be larger than those for the former case. The retardation factors estimated for the breakthroughs of iodide under discrete influent application were closer to one, the expected retardation of a conservative tracer, than those estimated from breakthroughs under ponded influent application. The breakthrough curves of strontium and iodide at four locations across the caisson for up to four depths indicate significant spatial variability of solute transport.

The above results suggest that there is a lack of conservation of mass which was also observed in the unsaturated experiments. The changes in the values of estimated parameters, dispersion coefficient and retardation factor, with depth are probably a function of both the influent boundary conditions and spatial variability effects.

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EFFECTS FROM INFLUENT BOUNDARY CONDITIONS ON TRACER MIGRATION AND SPATIAL VARIABILITY FEATURES IN INTERMEDIATE-SCALE EXPERIMENTS

by

H. R. Fuentes, W. L. Polzer, and E. P. Springer

ABSTRACT

In previous unsaturated transport studies at Los Alamos dispersion coefficients were estimated to be higher close to the tracer source than at greater distances from the source. Injection of tracers through discrete influent outlets could have accounted for those higher dispersions. Also, a lack of conservation of mass of the tracers was observed and suspected to be due to spatial variability in transport. In the present study experiments were performed under uniform influent (ponded) conditions in which breakthrough of tracers was monitored at four locations at each of four depths. All other conditions were similar to those of the unsaturated transport experiments. A comparison of results from these two sets of experiments indicates differences in the parameter estimates. Estimates were made for the dispersion coefficient and the retardation factor by the one-dimensional steady flow computer code, CFITIM. Estimates were also made for mass and for velocity and the dispersion coefficient by the method of moments. The dispersion coefficient decreased with depth under discrete influent application and increased with depth under ponded influent application. Retardation was predicted better under the discrete influent application than under ponded influent application. Differences in breakthroughs and in estimated parameters among locations at the same depth were observed under ponded influent application. Those differences indicate that there is a lack of conservation of mass as well as significant spatial variability across the experimental domain.

I. INTRODUCTION

Since 1980 Los Alamos National Laboratory (Los Alamos) has conducted laboratory and caisson (Figure 1) experiments to better understand the physics and chemistry of radionuclide migration in porous media¹. Efforts have

concentrated in the unsaturated zone to answer questions raised by technical requirements in 10 CFR Part 61 that are prerequisites to meeting performance objectives issued by the Nuclear Regulatory Commission (NRC). A major emphasis has been on the siting requirement that the disposal area is capable of being modeled. Modeling capabilities should allow the evaluation of the fate of potential contaminant releases from disposal sites.

Intermediate scale caisson experiments were performed under unsaturated, near steady flow conditions using potassium iodide (KI), lithium bromide (LiBr), and strontium acetate $[Sr(C_2H_3O_2)_2]$ as tracers. All experiments used crushed Bandelier tuff as the porous material to simulate backfill conditions expected to occur at a low-level waste disposal site. Dispersion coefficients estimated from those experiments revealed a decreasing pattern from the near surface with depth². A factor in this decreasing pattern was the application of the tracer solution through 96 discrete outlets across the 3-m cross-sectional area which were operated with a uniform flow among individual outlets³.

Recent analyses of the previous experiments indicate not only source injection effects, but also spatially variable advective effects in the caisson as problems in estimating system response^{4,5}. Tracer concentrations were sampled at only one location in the horizontal plane per depth. The variability across the caisson could possibly account for the effects being observed at various sample depths and the lack of mass conservation observed in the earlier experiments⁴.

Consequently, a new experiment was performed to examine high dispersion coefficients near the source and to estimate the significance of nonuniform conditions throughout the caisson.

The major objectives of this study were: (1) to compare the effects of uniform and discrete application of tracer influent solution on transport parameter estimates and on tracer breakthrough curves; and (2) to evaluate the effect of spatial differences of tracer breakthrough on parameter estimates.

In order to achieve the first objective the tuff in the caisson was saturated with 0.01 N CaCl_2 solution and a constant head was maintained during and after the injection of a pulse of tracers. The ponded condition minimized moisture content variations and thus simplified transport modeling. Previous experiments had been performed under unsaturated flow conditions in which tracers were applied at 96 discrete locations. In order to achieve the second objective solution samplers were installed at four locations within a horizontal cross-sectional area at each of four depths. The tracer concentration data in solutions obtained from those samplers were used to characterize spatial variability of tracer transport.

This report documents the study by ordered inclusion of data files on the operational features of the experiment and on measured parameters. Analyses of the experimental data are included for comparison of the effects of uniform and discrete applications on the dispersion coefficients, pore water velocities, and retardation factor estimates. Also, analyses are included to illustrate the spatial variability of tracer transport. Parameter estimates and breakthrough curves are used in these illustrations.

II. EXPERIMENTAL DESIGN

Details on the caisson geometry and operational features have been documented in detail in previous reports^{2,3}. Figure 1 presents the major components of the 3-m x 10-m cylindrical caisson and its major complementary operational components. Major modifications with respect to past experiments (all in unsaturated flow conditions) are as follows:

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- a. Pumps were installed to control the inflow and outflow at approximately 200 mL min^{-1} during and after the application of the pulse of tracers. The outflow pump also served as an inflow pump during the process of slowly saturating the caisson from the bottom prior to the beginning of the experiment.
- b. A float valve assured a continuous 3-cm water head above the tuff surface.
- c. A piezometer was emplaced at the bottom of the caisson (within the tuff) to document the overall head loss in the caisson. During the saturating process at the beginning of the experiment the wetting front was monitored with the piezometer.
- d. Additional sampling locations were installed for the spatial variability evaluation (only one was used in previous experiments). Those locations were determined by a stratified random selection.

In regards to the last modification, four depths (B8, B7, B5 and B3, at 0.36, 1.13, 2.64 and 4.16 m, respectively, see Fig. 2) were chosen for the emplacements of these solution samplers. Those depths allowed spatial variability characterization throughout the entire caisson. The difference between the two depths near the surface (0.36 and 1.13 m) was less than differences between other depths. That smaller difference provided better characterization for the breakthrough curves of strontium, a relatively slow moving tracer compared to iodide.

Previous analyses of caisson data by various flow and transport models⁵ indicated physical differences in the tuff within the caisson. Therefore, to better characterize spatial variability the caisson cross-circular area was divided into approximately 68 squares of 225 cm^2 each. The squares were identified with a number and were chosen randomly. If a chosen square was

within 15 cm of another instrument location or within 30 cm of the outer edge of the caisson, then another square was chosen. A total of 16 new samplers, one per quadrant, was installed. The coordinates of the samplers are listed in Table I for the system of cartesian coordinates shown in Figure 2.

The tuff was saturated by slowly adding 0.01 N CaCl_2 solution to the caisson from the bottom. More than three weeks were needed in order to complete the saturation process (Figure 3). This method of saturating the tuff minimized the presence of air pockets. After the tuff became saturated, 0.01 N CaCl_2 solution was applied to the tuff surface by maintaining a 3-cm hydraulic head on the caisson surface until inflow and outflow rates reached a near-steady flow of 200 mL min^{-1} ; outflow was regulated by pumping the effluent from the bottom of the caisson with minimal differential head. Background chemical and physical parameters were characterized over a three day period before the application of the tracer pulse.

Day zero for the pulse application was on the 18th of July 1986. A 6-day pulse of tracers in 0.01N CaCl_2 solution replaced the 0.01N CaCl_2 solution. A concentrated tracer solution was made by adding 650 g CsI, 217 g LiBr, 514 g $\text{Sr}(\text{C}_2\text{H}_3\text{O}_2)_2$ and 1384 g CaCl_2 to 25 L of distilled water. A 1:100 dilution of the concentrated solution formed the tracer solution. Change of solutions at the beginning and end of the pulse period was completed within 8 minutes by removing the head of water from the surface and quickly replacing it with either the tracer solution or the 0.01 N CaCl_2 solution.

The addition of 0.01 N CaCl_2 solution followed the pulse at a continuous flow rate of about 200 mL min^{-1} for 46 days beginning the 1st of August 1986. During the flushing period intensive sampling and measurement efforts were conducted at various levels for the physical and chemical parameters included in Table II. This table details the sampling strategy for the study. This

strategy defines the minimum monitoring efforts achieved during the experiment. Although lithium and cesium were added as tracers in order to replicate conditions of previous unsaturated flow experiments, only iodide and strontium were analyzed in this study.

Samples were collected in 50-ml polyethylene centrifuge tubes with screw-on caps and stored until chemical analysis. Samples for strontium analyses were acidified with HNO_3 to about pH 2. Analyses of dissolved oxygen (O_2), pH, Eh and alkalinity were completed within a few hours of sampling.

Samples analyzed for dissolved oxygen, pH, Eh, and alkalinity were carefully handled to minimize chemistry changes during collection, preservation, and analyses. Dissolved oxygen was measured with a Yellow Springs Instruments oxygen probe and meter, which was calibrated with air. Eh was measured with a platinum combination electrode and an expandable pH meter. The electrode was standardized with reference solutions containing mixtures of potassium ferrous and ferric cyanide. Alkalinity was determined by the titration method using a Fisher pH meter, titrameter, and mixer. A combination pH electrode was used and periodically referenced to standard buffers of pH 7 and 4. The pH measurements were taken at the time that alkalinity titrations were made. Iodide was determined with an ion selective electrode. Strontium, calcium, and magnesium were determined by the inductively coupled plasma (ICP) method. Potassium, sodium, silica, and cesium were determined by the flame atomic absorption method. Chloride, phosphate and sulfate were determined by ion chromatography.

III. EXPERIMENTAL DATA

This report documents operational features and measured parameters recorded during the experiment. The data base collected from these

intermediate-scale experiments, e.g., caisson experiments, is important in the verification, validation, and selection of mathematical models.

Appendices A, B and C respectively correspond to the physical variables, chemical concentrations of target tracers and species in solution, and moisture content profiles for the entire experimental period. Data are documented as functions of time and sampling location within the caisson to facilitate a precise mathematical representation of the experiment.

Appendix A contains data on temperature and flow rates. Appendix B contains all the chemical measurements made in accordance to the sampling strategy of Table II. This sampling strategy defined the solution chemistry before and during the tracer migration period.

Measurements were made for pH, Eh, dissolved oxygen and alkalinity. Specific ion determinations included iodide, strontium, cesium, silica, chloride, phosphate, calcium, magnesium, potassium, and sodium. The number and kinds of analyses were dictated by availability of funds and efficient and reliable analytical chemistry capabilities. Within those constraints chemical parameters were selected for analysis on the basis that the above cations and anions were potentially critical in controlling the chemistry of the solution.

Appendix C includes records of moisture content throughout the caisson. At each sampling depth three measurements were taken along the caisson radius (0, 60, and 120 cm from the center).

Detailed procedures for the collection, preservation, and analysis of samples as well as detailed documentation of the data and Quality Assurance procedures are on file at Los Alamos.

IV. MODELING

CFITIM. A computer code called CFITIM⁶ was used to interpret the experimental results. This code provides a solution of the one-dimensional

convective-dispersive equation and takes into consideration adsorption.

Adsorption is described by a linear isotherm and thus the following overall expression evolves:

$$\frac{\partial C}{\partial t} = \frac{D}{R} \frac{\partial^2 C}{\partial z^2} - \frac{V}{R} \frac{\partial C}{\partial z} \quad (1)$$

or

$$\frac{\partial C}{\partial t} = D_r \frac{\partial^2 C}{\partial z^2} - V_r \frac{\partial C}{\partial z} \quad (2)$$

where

C = tracer solution concentration

t = time (days)

z = caisson depth (cm)

$D_r = D/R$ = apparent dispersion coefficient when $R \neq 1$ ($\text{cm}^2 \text{ day}^{-1}$).

$V_r = V/R$ = apparent average pore-water velocity when $R \neq 1$ (cm day^{-1}).

$R = 1 + \frac{\rho K_d}{\theta}$ = retardation factor.

D = dispersion coefficient ($\text{cm}^2 \text{ day}^{-1}$)

V = average pore water velocity (cm day^{-1})

θ = volumetric tuff water content ($\text{cm}^3 \text{ cm}^{-3}$)

ρ = tuff bulk density (g cm^3), and

K_d = distribution coefficient estimated from a linear isotherm ($\text{cm}^3 \text{ g}^{-1}$)

The code provides an optimal fit of flow and transport parameters by the least-squares technique. The analytical solution used by the model corresponds to boundary conditions for a pulse application of tracers and a semi-infinite caisson geometry. The code has been described and used in previous analyses^{4,5}. CFITIM permits the fixing of one of three parameters (pulse time, dispersion coefficient or retardation factor), and allows the other two parameters to vary for optimization. In these analyses the pulse

time was fixed (6 days) and the dispersion coefficient and retardation factor were left to vary for optimization.

Method of moments. The method of moments is a simple technique that can be applied to concentration breakthrough curves to determine velocity and dispersion coefficients. The method is described by Turner⁷ and was confirmed by Valocchi⁸ and Jury and Sposito⁹. Duffy¹⁰ analyzed the results of one of the previous experiments using the method of moments in both the time and frequency domain.

The analysis presented here will require the following moments:

$$M_0 = \int_0^T C(x,t) dt \quad (3)$$

$$M_1 = \int_0^T t C(x,t) dt \quad (4)$$

$$M_2 = \int_0^T t^2 C(x,t) dt \quad (5)$$

where M_0 = zero moment of the $C(x,t)$ function, (mg day),
 M_1 = first moment of the $C(x,t)$ function, (mg day²),
 M_2 = second moment of the $C(x,t)$ function, (mg day³),
 T = duration of breakthrough curve (days), and
 $C(x,t)$ = concentration of the tracer at location x and time t (mg mL⁻¹).

The zero moment, M_0 , is the mass of tracer passing the location x . Using the square wave input with duration T_0 , the following equations from Turner⁷ will give the pore water velocity (Equation 6a) and dispersion coefficient (Equation 6b) for the advection-dispersion condition

$$V = x / \left(\frac{M_1}{M_0} - \hat{M}_1 \right) \quad (6a)$$

$$D = \frac{V^3}{2x} \left[\frac{M_2}{M_0} - \left(\frac{M_1}{M_0} \right)^2 \right] - \hat{M}_2 \quad (6b)$$

where $\hat{M}_1$ = the first moment of the input function $T_0/2$ (day),
 $\hat{M}_2$ = the second central moment of the input function $T_0^2/2$, (day²),
 and

x = the location of the sampler from the source (cm).

The values for $\hat{M}_1$ and $\hat{M}_2$ are the mean and variance for a uniform distribution (square-wave input) with a range of 0 to T_0 . For a $T_0 = 6$ days, the values for $\hat{M}_1$ and $\hat{M}_2$ were 3 days and 3 (days²), respectively.

V. ANALYSIS

CFITIM. Results were analyzed in a twofold way. First, qualitative analyses of the breakthrough curves of iodide and strontium at the various sampling depths were performed. Inferences were then made on the effect of discrete point sources and uniform (ponded) applications of tracer solutions on subsurface flow patterns, as well as on spatial differences among sampling locations at the same depth and among sampling depths. Second, dispersion coefficients and retardation factors for iodine were estimated with the use of the computer code CFITIM. These estimates were used to complement qualitative inferences and to characterize the performance of simple models, such as the one-dimensional approach of CFITIM.

The breakthrough curves for pulses P2 and P3, consecutively performed between December 6, 1984 and April 7, 1985⁴ are presented for five sampling depths in Figures 4A through 7A. Influent was applied at 96 discrete locations on the tuff surface and unsaturated flow conditions were maintained.

These breakthrough curves are introduced so that the results from previous experiments using discrete point application on the surface can be compared to those results from an experiment having a constant ponded water surface (Figures 4B through 7B).

Figures 4A through 7A show larger dispersion near the source and a gradual decrease of dispersion coefficients with depth (36 through 415 cm), whereas in Figures 4B through 7B, the opposite trend, an increasing dispersion with depth is observed. These two opposite patterns suggest that behavior of the dispersion coefficient with travel distance is strongly connected to the influent boundary conditions (or source term). The increasing dispersion for the ponded influent experiment also occurs for strontium, as shown in Figures 8 and 9. These two figures only include the 36- and 113-cm depths because of the slow migration of strontium. Strontium was not observed at lower depths during the 46-day monitoring period after pulse application.

Comparisons of breakthrough curves among four locations at the same depth for the ponded experiment (Figures 4B through 7B) reveal minimum differences in breakthrough for iodide among locations at the 36-cm depth. Larger differences in shape and arrival time of breakthroughs are observed at lower depths. The movement of iodide as a function of depth can be characterized as follows: at the 113-cm depth iodide separates into two fronts (breakthroughs at B7Q1, B7Q3, and B7Q4 have two peaks); these pulses travel at different rates in the lower depth. Short-circuiting of iodide flow may occur between the 264- and 415-cm depths; in quadrant Q1 iodide appears at the 415-cm depth before it appears at the 264-cm depth. The difference in the travel time of the two fronts indicates the presence of at least two flow zones as well as localized heterogeneities in the caisson as indicated by other modeling attempts⁵. Coincidentally, strontium behaves similarly to iodide through the first 113 cm (Compare Figures 4B with 8 and 5B with 9).

Modeling efforts of past experiments and of the ponded trial are summarized in Table III. In all cases, modeling was performed by fixing the pulse time (6 days) and letting the computer code CFITIM optimize the dispersion coefficient and retardation factors. The decreasing dispersion with depth under discrete influent application is verified in contrast to the increasing pattern obtained for the ponded boundary condition. Changes in dispersion coefficients are much larger in the latter case. The prediction of retardation factors is not as effective under the ponded conditions as that under discrete influent application. Iodide, a conservative tracer, should exhibit a retardation factor of about one. Data in Table IV clearly show differences in estimated parameters among samplers at the same depth; differences yield ratios up to 3:1 for dispersion coefficients and 1.5:1 for retardation.

Moments analyses. Table V lists the zero moments for the various quadrants at each depth for iodide. For the inflow the value of M_0 is estimated to be 692 mg. The fraction of mass conserved is the zero moment for a quadrant divided by the zero moment for the inflow. The calculated fractions are also given in Table V. The value for M_0 in the outflow was 372.2 mg which corresponds to a mass conservation of 54 percent.

The relatively good conservation of mass at the 36 cm depth (>90 percent) can be related to minimum spread observed in the concentration breakthrough curves (Figure 4B). Also, the proximity of this sampling depth to the source and the velocity of the tracers can be expected to have an impact on conservation of mass. Below the 36 cm sampling depth, mass conservation decreased and the only consistent pattern was that quadrant Q4 conserved the highest percent of mass at all depths. No particular reason can be given for this observed response. Obviously, problems in conserving tracer mass still

exist and become even more dramatic as one views each horizontal plane. The first and second moments (equations 4 and 5) are used in equations 6a and 6b to determine the pore water velocities and dispersion coefficients. The values for V and D are given for each quadrant and each sampling depth in Table VI. Velocities or dispersion coefficients derived from locations where mass conservation was low (refer to previous section) must be viewed skeptically. Also, because errors in the method of moments are cumulative¹⁰, estimates of the velocities should be viewed as somewhat more accurate than the values for the dispersion coefficient.

The pore water velocity estimates in Table VI indicate the following general trend with depth. The velocities at 36-cm depth are near the anticipated value of 14 cm day⁻¹. At the 113-cm sampling depth, the velocities are approximately half the design value for all quadrants. The three estimates at the 264-cm sampling depth range from 7.3-16 cm day⁻¹. Finally, at the 415-cm sampling depth, the estimates are higher for three of the quadrants with the maximum value over the entire caisson of 25.3 cm day⁻¹ observed in quadrant Q4.

The dispersion coefficients increased with depth which is the same pattern observed with the CFITIM analyses. However, it should be noted that the cumulative errors associated with the estimation of higher order moments and the use of incomplete breakthrough curves for 264- and 415-cm sampling depths for estimating these dispersion coefficients are considerable.

The most obvious result at the 113-cm depth for pore water velocities is the fact that the values are approximately half of the target value, and lower than the velocities from the 36-cm sampling depth. This may explain the high retardation values (≈ 2) found for iodide at the 113-cm sampling depth from the CFITIM analyses given in Table IV.

The cause of this velocity reduction is not known. If a constant Darcy flux of 4.07 cm day^{-1} is assumed, then the volumetric water content (θ) required to attain a pore water velocity of 14 cm day^{-1} is 0.285. To reduce the pore water velocity to 7 cm day^{-1} , a water content of 0.57 is needed. The consistency of the pore water velocities at each of the 36- and 113-cm sampling depths indicates that a physical mechanism is responsible for the estimated velocity reduction.

The dispersion coefficients increase with depth or distance regardless of the velocity fluctuations. For quadrant Q4, at the 36-cm depth the velocity is $11.09 \text{ cm day}^{-1}$ and the dispersion coefficient is $13.25 \text{ cm}^2 \text{ day}^{-1}$. At 113 cm, the pore water velocity in quadrant Q4 decreased to 7.47 cm day^{-1} and the dispersion coefficient increased to $78.51 \text{ cm}^2 \text{ day}^{-1}$. This is a result of the scale effect that has been reported in the literature^{11,12}. Gehkar¹³ and Marsily¹⁴ analyzed the growth of dispersion with distance as a temporal effect due to travel time through the porous media. This behavior is more consistent with previous observations of solute behavior in porous media at scales larger than laboratory columns. This behavior is consistent with the increase in dispersion with depth observed in our saturated experiment, but is in opposition to the observed decrease in dispersion with depth in the unsaturated experiments. Results from this study and previous studies indicate the significance of boundary and soil moisture conditions on solute transport near the source (within 6 m of contamination).

Composite behavior. The parameters describing the movement of the iodide in each quadrant using the moments of the advection-dispersion equation are given in Table VI. In another analysis the pore water velocities and dispersion coefficients were estimated for the "mean" breakthrough curve at

each depth. The "mean" curve was formed by adding the concentrations for each quadrant at a depth and dividing by 4, the number of quadrants (3 for the 264-cm depth). This effectively creates a one-dimensional breakthrough curve as was used in the previous experiments^{4,5}. The pore water velocity and dispersion coefficients for the "mean" breakthrough are presented in Table VII.

The pattern with depth for these effective parameters are essentially the same as the patterns noted for the parameters in Table VI. The values of the effective parameters for "mean" breakthrough at each depth (Table VII) can be compared directly to the mean of the values of these parameters derived for each quadrant for each sampling depth (Table VI). Statistics using arithmetic and logarithmic transformations of the values in Table VII are given in Table VIII. Mean values for the pore water velocities are consistent for all the sampling depths regardless of the transformation. The standard deviations of the pore water velocities for the two transformations differ at the 264-cm sampling depth with the logarithmically transformed variate having a much higher value. This result must be viewed cautiously because the sample size for the 264-cm sampling depth is only 2. The mean values for the dispersion coefficient again agree fairly well for nontransformed or transformed variates for the 36- and 113-cm sampling depths, but the standard deviations are quite different depending on the transformation. The trend of increasing dispersion coefficients with depth remains with the mean values. Again, the sample size limits any discussion on the 264-cm depth.

VI. CONCLUSIONS

Analyses of tracer breakthrough curves from the ponded steady flow experiment and their comparison with results from previous experiments with

discrete point application and unsaturated, steady-flow conditions suggest the following conclusions.

1. For the ponded boundary condition analyses with either the CFITIM or method of moments indicates increasing dispersion coefficients with depth. For the unsaturated flow conditions and point source application of influent, the dispersion coefficient was seen to decrease with depth. Moment analyses revealed considerable pore water velocity variations between depths, but not at any given depth. It is not clear if the boundary conditions (ponded versus discrete point flux), the moisture conditions that exist during the experiment (saturated versus unsaturated) or most probably a combination of these factors have the observed effect on the dispersion coefficient. The implication of these effects on prediction of site performance can be substantial. The ponded case with an increasing dispersion coefficient with travel distance represents a more conservative approach to predicting solute movement.
2. Although care was taken in filling and packing the caisson with tuff and control was exercised over the boundary conditions, the horizontal differences in tracer breakthrough curves were substantial. The differences became more pronounced with depth. These results suggest caution must be used when referring to a medium as homogeneous. There is considerable variability in boundary conditions and tracer transport behavior in this caisson which is an intermediate-scale situation. A waste disposal site (a field-scale situation) is expected to exhibit even more variability than the caisson because of the variable nature of the operations conducted at a disposal site.
3. The one-dimensional analyses using the advection-dispersion equation are limited. If the velocities estimated by the method of moments are considered, various regions of the caisson have higher velocities hence

lateral concentration gradients will be established. The one-dimensional analyses (CFITIM and method of moments) do not consider transverse dispersion or diffusion. Also, other features such as short circuiting or dead space can be affecting tracer transport. The data collected in the ponded experiment will support a multidimensional modeling effort better than the data from previous experiments with a single sampler per depth. Still, more information on the nature of the flow hydraulics is needed to complete a multidimensional solute transport modeling effort.

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TABLE I
COORDINATES FOR CONCENTRATION SAMPLERS^a

SAMPLER	X (cm)	Y (cm)	Z (cm)
B8Q1	22.86	70.98	-36.0
B8Q2	-22.86	70.98	-36.0
B8Q3	-38.10	-66.18	-36.0
B8Q4	22.86	-66.18	-36.0
(B8L) ^b	-0.62	-0.14	-36.0
B7Q1	38.10	40.50	-113.0
B7Q2	-83.82	70.98	-113.0
B7Q3	-38.10	-35.70	-113.0
B7Q4	83.82	-20.46	-113.0
(B7L) ^b	-0.34	-0.04	-113.0
B5Q1	38.10	25.25	-264.0
B5Q2	-22.86	40.56	-264.0
B5Q3	-22.86	-96.66	-264.0
B5Q4	68.58	-35.70	-264.0
(B5R) ^b	0.46	-0.05	-264.0
B3Q1	53.34	25.26	-415.0
B3Q2	-83.32	55.74	-415.0
B3Q3	-22.86	-5.22	-415.0
B3Q4	38.10	-111.90	-415.0
(B3L) ^b	-0.27	-0.01	-415.0
B2	0.00	0.00	-550.0
B43 ^c	30.00	60.00	-43.0
B58 ^c	30.00	60.00	-58.0
B88 ^c	30.00	60.00	-88.00

^aOrigin of cartesian frame of reference (x=0, y=0, z=0) at the center of the tuff surface.

^bLocation of samplers in previous experiments.

^cVertical samplers.

TABLE II
SAMPLING STRATEGY^a

Parameter	Location	Number of Samples	Frequency	Period ^d
T, Q, H	Inflow	1	Daily	-3 → 46
T	B7,B3	2	Daily	-3 → 46
T, Q	Outflow	1	Daily	-3 → 46
Moisture Content	B8,B7,B5,B3	4	1/week	-3 → 46
pH, Eh, O ₂ , Alk	Inflow	1	3/week	-3 → 46
	B7,B3	2	3/week	-3 → 46
	Outflow	1	3/week	-3 → 46
I	Inflow	1	2/day	0 → 6
	B8	4	Daily	-4 → 14
			3/week	14 → 35
	B7	4	Daily	0 → 20
			3/week	20 → 42
	B5	4	Daily	6 → 28
			3/week	28 → 46
	B3	4	Daily	10 → 46
	Outflow	1	Daily	10 → 46
Sr	B8,B7	4	3/week	-4 → 46
	B43,B58,B88 ^c	1	3/week	-4 → 46
Ions ^b	B8,B7,B5	1	2/week	-4 → 46
	B88	1	2/week	-4 → 46

^aT = temperature; Q = flow; H = water head above the caisson surface; Eh = electro-potential; O₂ = dissolved oxygen; Alk = alkalinity

^bIons = SiO₂, Cl, PO₄, Ca, Mg, K, Na and Cs

^cVertical samplers.

^dThe period corresponds to the number of days of the experiment in relation to the day when the pulse was applied (zero-day).

TABLE III
EFFECTS OF THE APPLICATION MODE OF TRACER
SOLUTION TO THE TUFF SURFACE. ESTIMATES
FOR DISPERSION AND RETARDATION FACTORS BY
CFITIM FROM IODIDE BREAKTHROUGH

Depth (cm)	DISCRETE (Unsaturated Steady Flow)						PONDED ^a (Saturated Steady Flow)	
	August 1983 (46 outlets)		December 1984 (96 outlets)		February 1985 (96 outlets)		July 1986 (3-cm head)	
	D (cm ² day ⁻¹)	R	D (cm ² day ⁻¹)	R	D (cm ² day ⁻¹)	R	D (cm ² day ⁻¹)	R
36	136	2.4	29	1.1	54	0.9	6-16	1.0-1.2
113	32	1.4	21	1.1	46	1.0	72-148	1.8-2.7
264	34	1.1	15	0.7	15	0.7	>3,276 ^b	3.0-NA ^c
415	19	0.9	5	1.1	11	1.0	>4,336 ^b	2.1-NA ^c

^aRanges of parameters for four sampling locations.

^bValue for the only complete breakthrough. The sign > is inferred from the relative breakthrough patterns from all samplers.

^cNot available (NA) because of an incomplete breakthrough curve.

TABLE IV
VARIABILITY OF ESTIMATED DISPERSION AND RETARDATION
PARAMETERS AMONG SAMPLERS WITH COMPLETE IODIDE BREAKTHROUGH

Depth	Sampler ID	D (cm ² day ⁻¹)	$\bar{D}^b$ (cm ² day ⁻¹)	R	$\bar{R}^b$
36	B8Q1	14.5		1.1	
	B8Q2	10.4		0.9	
	B8Q3	5.8		1.1	
	B8Q4	5.6	9.1 ± 4.2	1.2	1.1 ± 0.1
113	B7Q1	72.2		2.7	
	B7Q2	112.4		2.0	
	B7Q3	147.6		1.8	
	B7Q4	75.8	102.0 ± 35.4	2.0	2.1 ± 0.4

^aThe computer code CFITIM was used to make dispersion (D) and retardation (R) parameter estimates. The pulse period (6 days) was fixed and the dispersion and retardation factors were fitted.

^b $\bar{D}$ and $\bar{R}$ are the respective means of the parameter estimates at each depth. The associated standard errors are also given.

TABLE V
ZERO MOMENTS AND PERCENTAGE OF MASS CONSERVED
FOR IODIDE IN THIS EXPERIMENT

MOMENT	QUADRANT			
	Q1	Q2	Q3	Q4
<u>36-cm Depth</u>				
M_o (mg)	622.45	626.80	630.6	656.25
M_o/M_{oi}^a	0.90	0.91	0.91	0.95
<u>113-cm Depth</u>				
M_o (mg)	516.82	496.10	553.0	671.75
M_o/M_{oi}	0.75	0.72	0.80	0.97
<u>264-cm Depth</u>				
M_o (mg)	73.05	1.btc. ^b	342.75	364.2
M_o/M_{oi}	0.11	1.btc.	0.50	0.53
<u>415-cm Depth</u>				
M_o (mg)	318.7	54.2	62.35	450.15
M_o/M_{oi}	0.46	0.08	0.09	0.65

^a M_{oi} is the inflow zero moment.

^bincomplete breakthrough curve.

TABLE VI
VELOCITY AND DISPERSION COEFFICIENT ESTIMATES
FOR EACH QUADRANT AT EACH SAMPLING DEPTH FOR IODIDE FROM
METHOD OF MOMENTS ANALYSIS

MOMENT	QUADRANT			
	Q1	Q2	Q3	Q4
<u>36-cm Depth</u>				
V (cm day ⁻¹)	11.78	13.27	11.96	11.09
D (cm ² day ⁻¹)	17.92	14.99	8.45	13.25
<u>113-cm Depth</u>				
V (cm day ⁻¹)	5.69	7.23	8.31	7.47
D (cm ² day ⁻¹)	39.67	55.09	68.14	78.51
<u>264-cm Depth</u>				
V (cm day ⁻¹)	7.28	---	9.99	15.96
D (cm ² day ⁻¹)	23.75	---	238.73	673.69
<u>415-cm Depth</u>				
V (cm day ⁻¹)	19.90	12.19	14.46	25.30
D (cm ² day ⁻¹)	981.39	75.64	280.51	2255.02

TABLE VII
PORE WATER VELOCITIES (V) AND DISPERSION
COEFFICIENTS (D) FROM THE METHOD OF MOMENTS FOR THE
"MEAN" BREAKTHROUGH CURVE AT EACH SAMPLING DEPTH

DEPTH (cm)	V (cm day ⁻¹)	D (cm ² day ⁻¹)
36	11.97	14.60
113	7.08	67.73
264	11.62	416.87
415	20.80	1385.37

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TABLE VIII
MEANS AND STANDARD DEVIATIONS OF THE PORE WATER
VELOCITIES (V) AND DISPERSION COEFFICIENTS (D) DERIVED BY
THE METHOD OF MOMENTS FOR EACH SAMPLING DEPTH USING ARITHMETIC
VALUES AND LOGARITHMIC TRANSFORMATION^a

SAMPLING DEPTH ^b (cm)	ARITHMETIC				LOGARITHMIC			
	V		D		V		D	
	(cm day ⁻¹)		(cm ² day ⁻¹)		(cm day ⁻¹)		(cm ² day ⁻¹)	
	$\bar{x}$	s	$\bar{x}$	s	$\bar{x}$	s	$\bar{x}$	s
36	12.02	0.91	13.65	3.97	12.03	0.81	13.86	20.81
113	7.18	1.09	60.35	16.79	7.20	1.34	61.10	343.83
264 ^c	12.98	4.22	456.21	307.56	13.34	20.64	524.85	196357.10

^aValues for V and D are given in Table VI.

^bAt the 415-cm depth only quadrant Q4 had sufficient mass conservation (50 percent or more), there values were not reported.

^cOnly two quadrants (mass conservation of 50 percent or more) were used at the 264-cm depth.

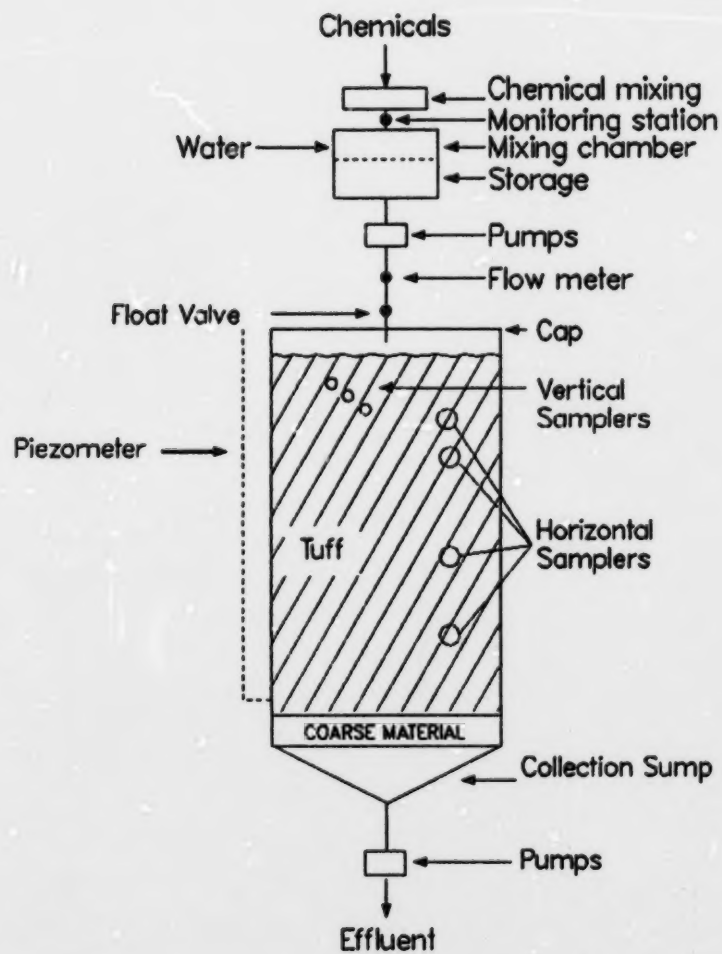


Figure 1. Schematic diagram showing Caisson B and its operational features.

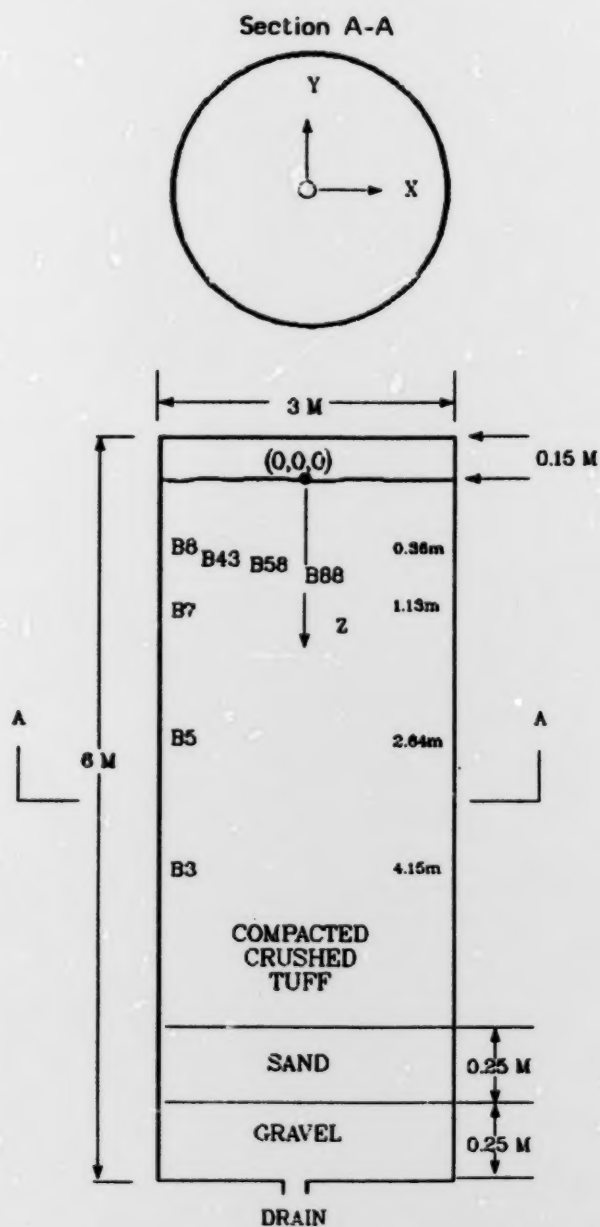


Figure 2. Schematic of the depth location of solution samplers in Caisson B and the origin of its cartesian system of coordinates.

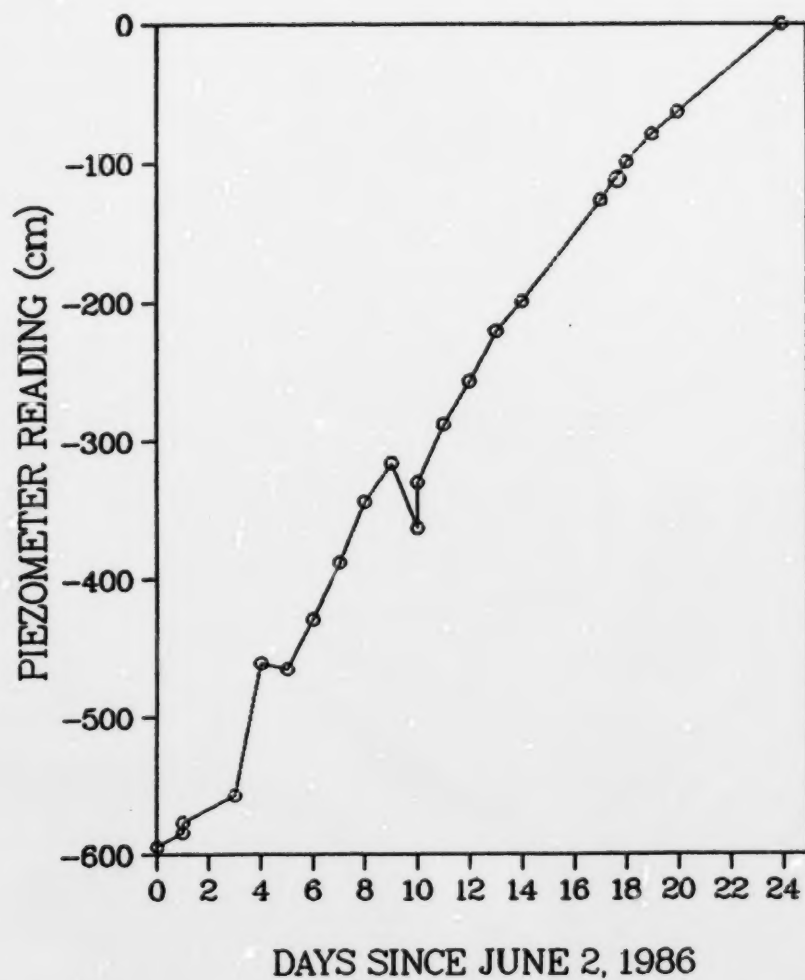


Figure 3. The rise of the water level as a function of time during the saturation of the tuff in Caisson B. The piezometer readings are referenced to the surface of the tuff.

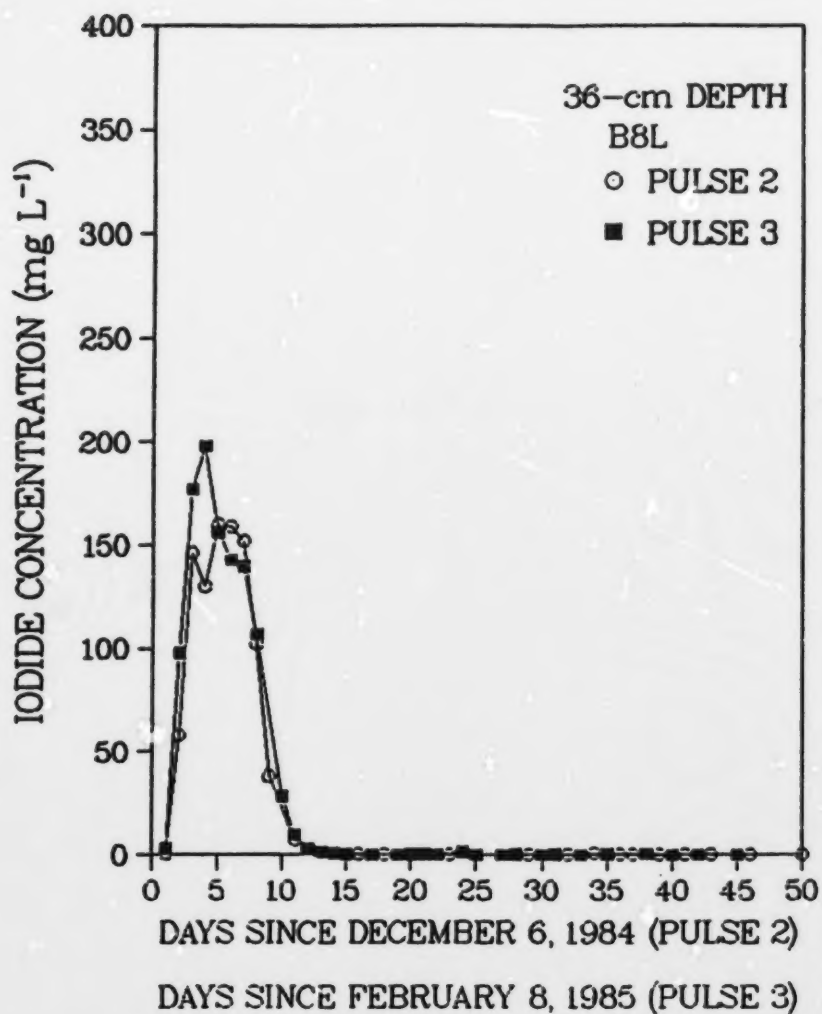


Figure 4A. Breakthrough curves for iodide from one sampling location at 36 cm under unsaturated steady flow conditions. Influent concentration = 167 mg L⁻¹. Influent solution applied through 96 outlets.

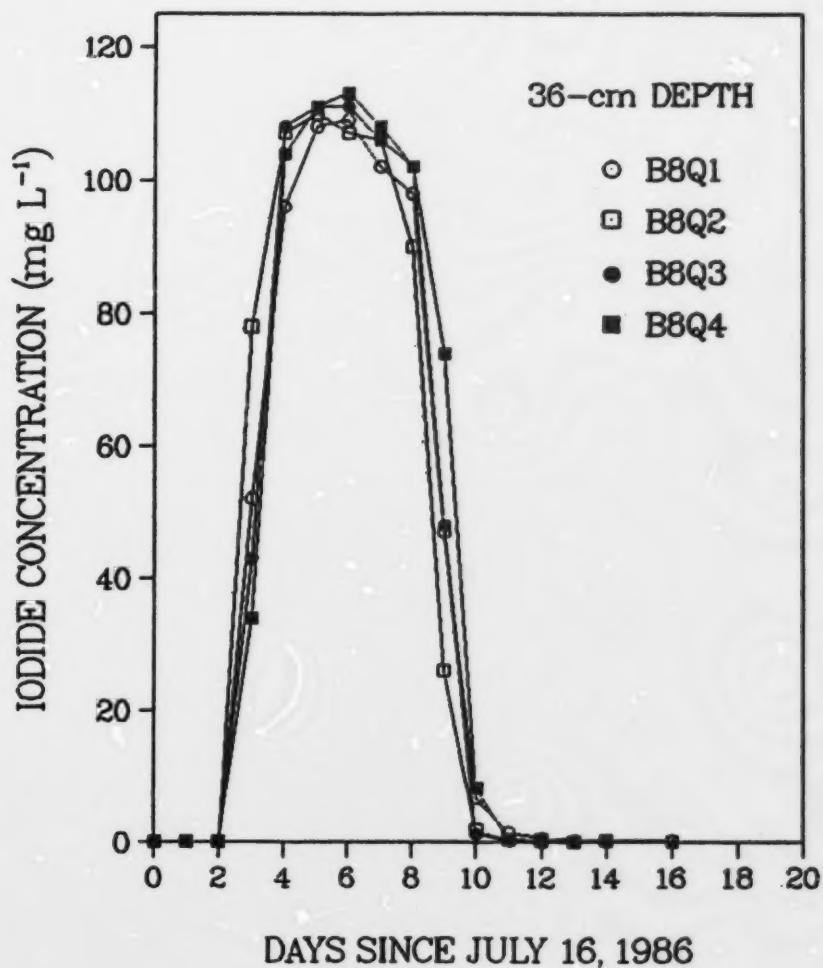


Figure 4B. Breakthrough curves for iodide from four sampling locations at 36 cm under saturated steady flow conditions. Influent concentration = $114 \pm 3 \text{ mg L}^{-1}$. Influent solution applied in ponded mode.

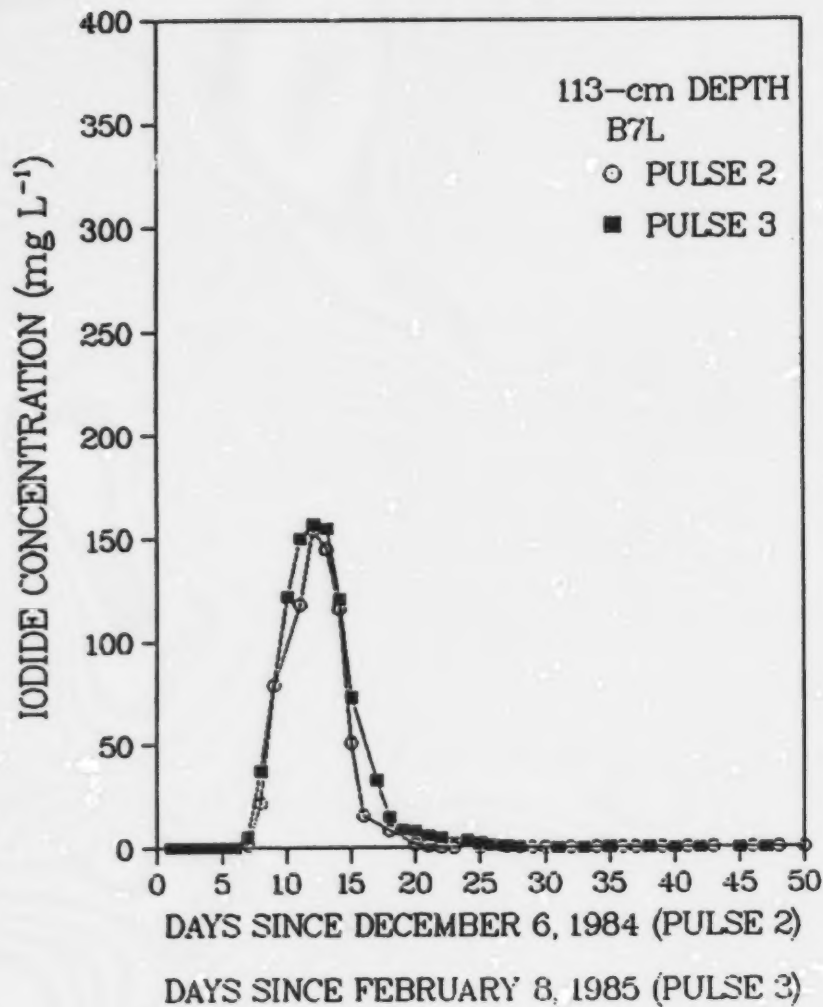


Figure 5A. Breakthrough curves for iodide from one sampling location at 113 cm under unsaturated steady flow conditions. Influent concentration = 167 mg L^{-1} . Influent solution applied through 96 outlets.

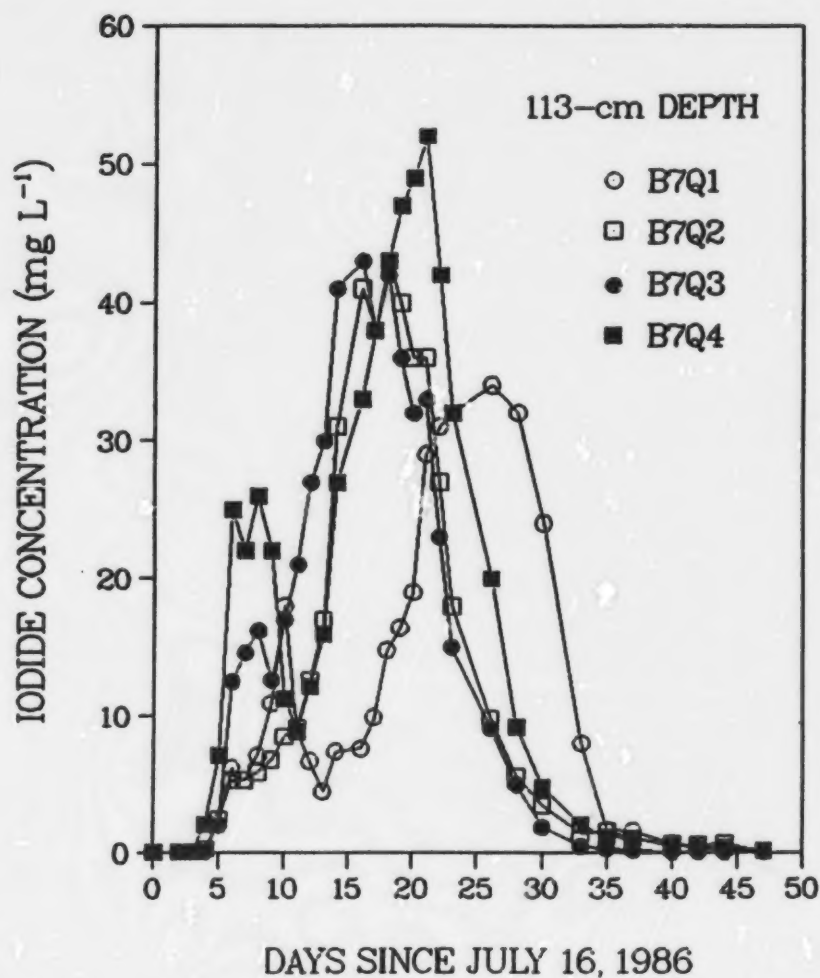


Figure 5B. Breakthrough curves for iodide from four sampling locations at 113 cm under saturated steady flow conditions. Influent concentration = 114 ± 3 mg L⁻¹. Influent solution applied in ponded mode.

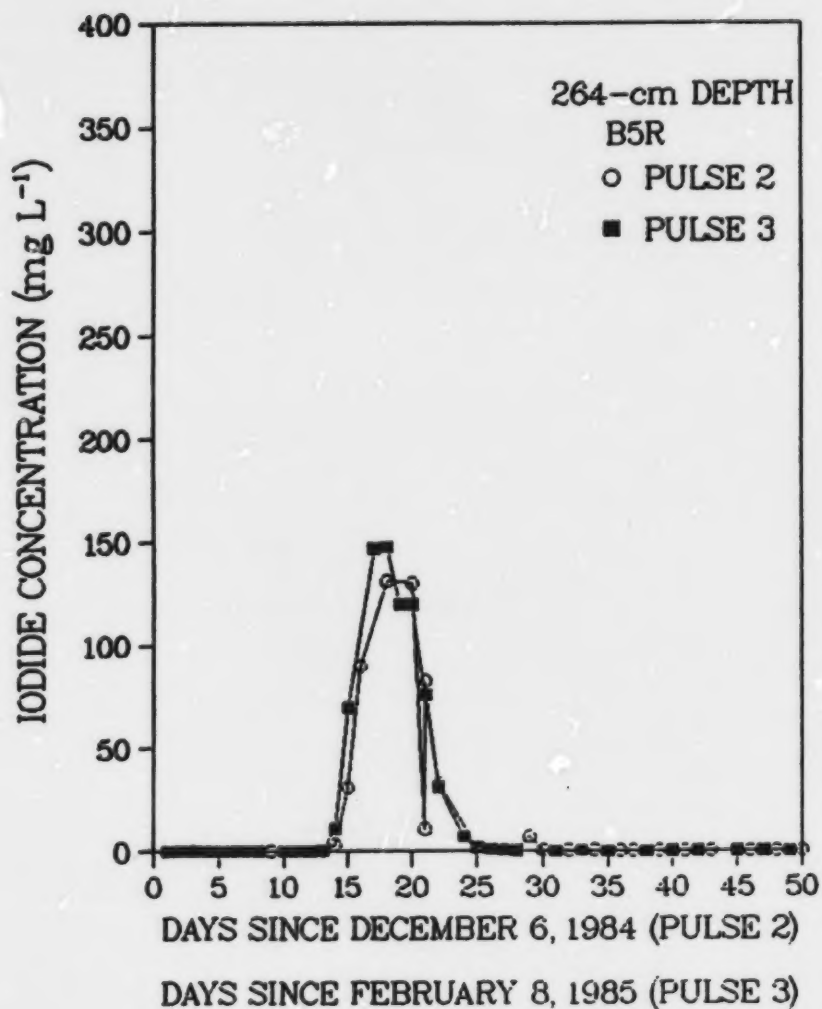


Figure 6A. Breakthrough curves for iodide from one sampling location at 264 cm under unsaturated steady flow conditions. Influent concentration = 167 mg L^{-1} . Influent solution applied through 96 outlets.

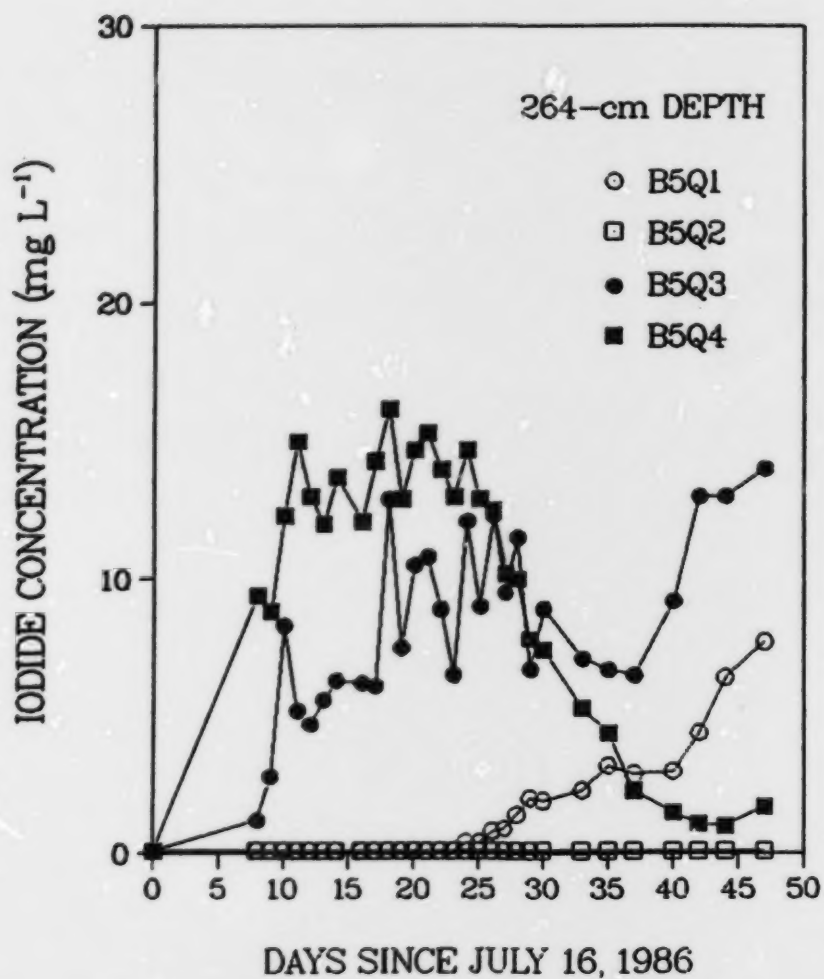


Figure 6B. Breakthrough curves for iodide from four sampling locations at 264 cm under saturated steady flow conditions. Influent concentration = 114 ± 3 mg L⁻¹. Influent solution applied in ponded mode.

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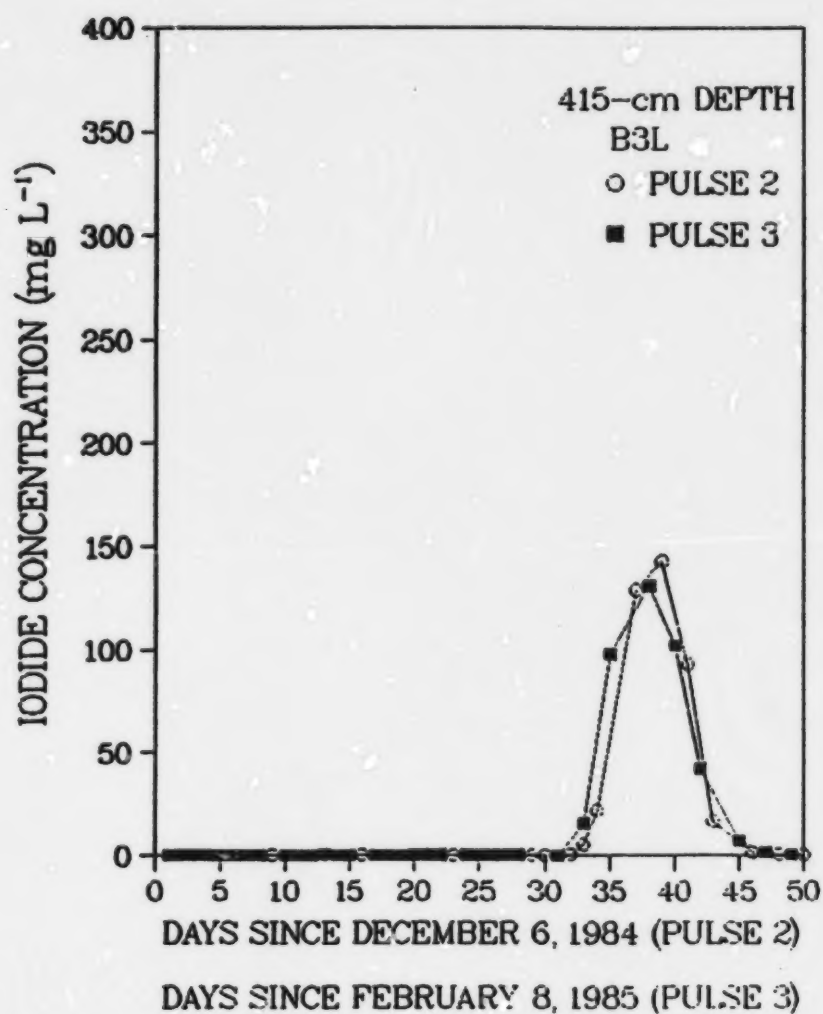


Figure 7A. Breakthrough curves for iodide from one sampling location at 415 cm under unsaturated steady flow conditions. Influent concentration = 167 mg L^{-1} . Influent solution applied through 96 outlets.

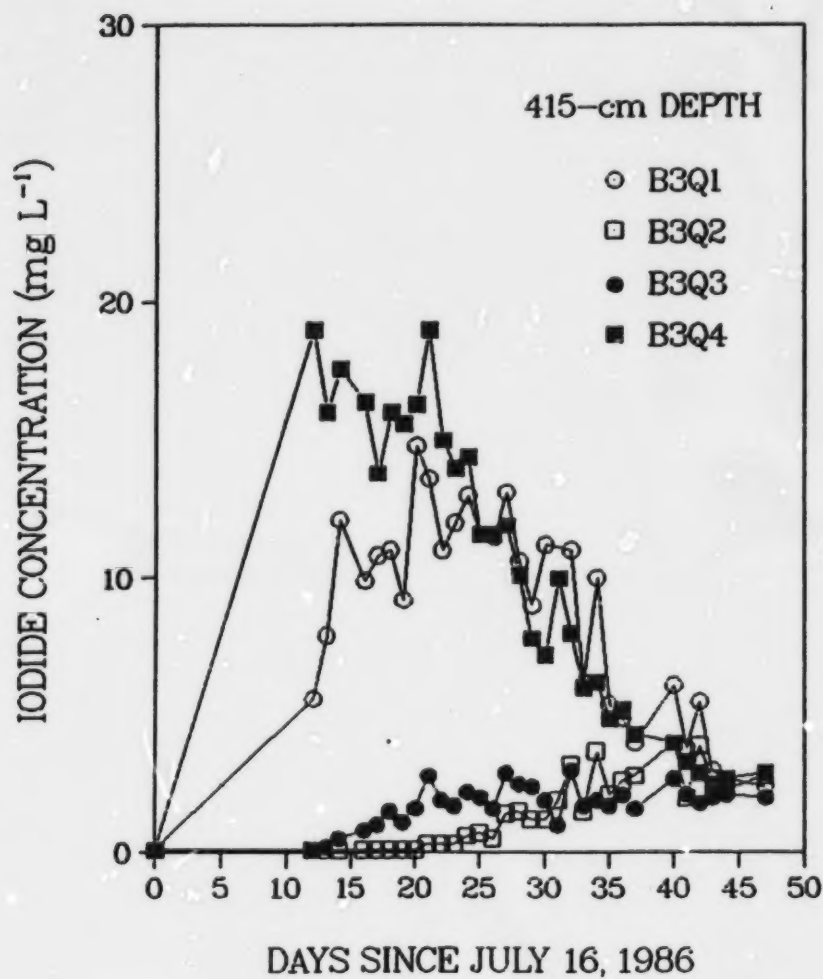


Figure 7B. Breakthrough curves for iodide from four sampling locations at 415 cm under saturated steady flow conditions. Influent concentration = 114 ± 3 mg L⁻¹. Influent solution applied in ponded mode.

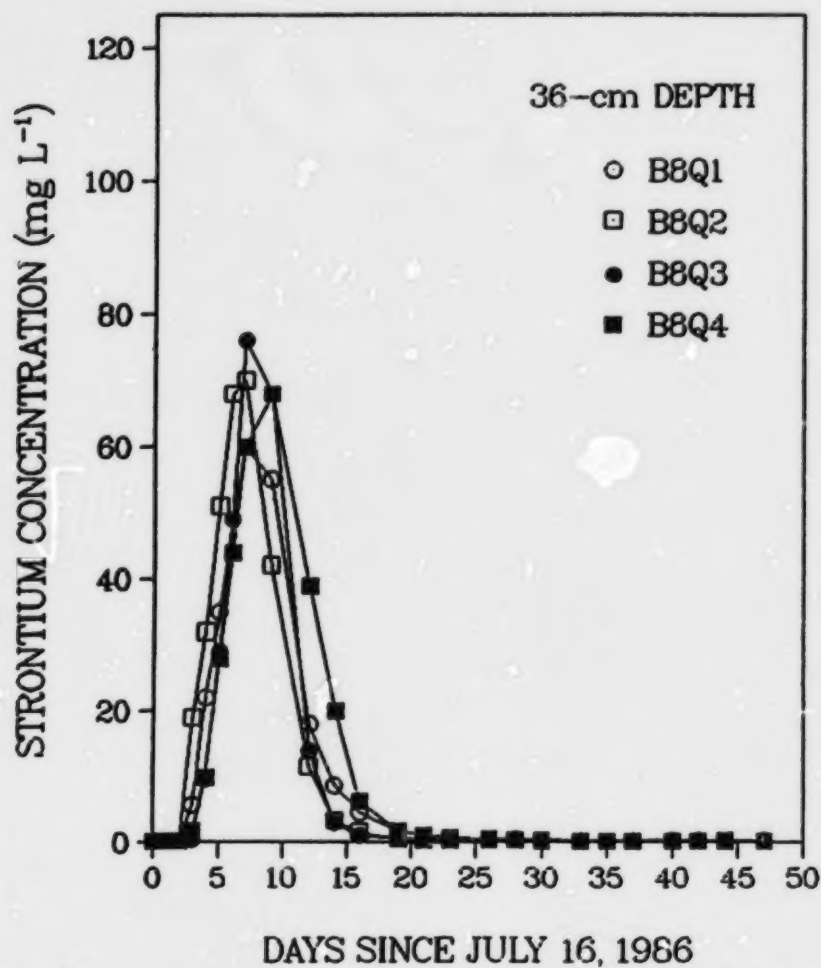


Figure 8. Breakthrough curves for strontium from four sampling locations at 36 cm under saturated steady flow conditions. Influent concentrations = 76.4 ± 2.2 mg L⁻¹. Influent solution applied in ponded mode.

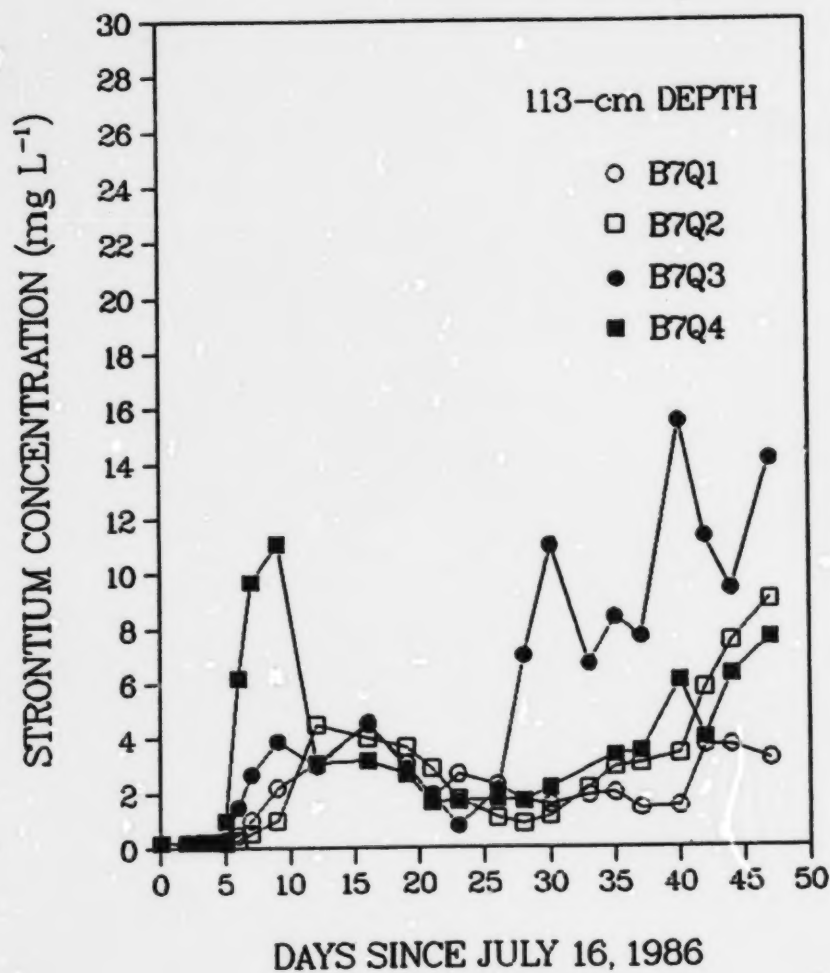


Figure 9. Breakthrough curves for strontium from four sampling locations at 113 cm under saturated steady flow conditions. Influent concentration = 76.4 ± 2.2 mg L⁻¹. Influent solution applied in ponded mode.

Appendix A

Physical Parameters

Temperature ($^{\circ}\text{C}$) and Flow Rate (mL/min)

TABLE A.1.A
PHYSICAL PARAMETER: TEMPERATURE

DEPTH-113 cm.

DATE	HOUR	QUADRANT 1	QUADRANT 2	QUADRANT 3	QUADRANT 4
071686	9:10	18.0	21.0	.	.
071686	9:15	.	.	21.0	20.0
071886	11:45	19.0	21.0	21.0	19.0
071986	10:30	19.0	20.0	20.0	19.5
072086	12:30	20.0	.	21.0	.
072186	13:00	21.0	.	.	.
072186	13:15	.	.	.	19.0
072286	13:00	.	20.0	.	.
072286	13:15	.	.	.	19.0
072386	14:00	20.0	.	.	20.0
072486	14:00	.	20.5	21.0	.
072586	13:45	.	.	20.0	20.0
072686	14:25	.	.	20.0	.
072686	15:02	19.5	.	.	.
072786	13:56	19.0	.	.	.
072786	14:24	.	.	20.5	.
072886	13:30	22.0	.	.	.
072886	13:45	.	21.0	.	.
072986	13:50	22.0	.	.	.
072986	14:10	.	22.0	.	.
073086	13:30	.	22.0	.	.
073086	13:35	.	.	23.0	.
073186	13:35	21.0	.	.	.
073186	13:45	.	21.0	.	.
080186	13:30	24.0	.	.	.
080186	13:35	.	22.0	.	.
080286	13:08	.	.	22.1	.
080286	13:12	.	.	.	21.2
080386	.	.	.	.	22.0
080386	13:30	21.0	.	.	.
080486	13:00	21.0	.	.	.
080486	13:15	.	21.0	.	.
080586	13:00	.	21.0	.	.
080586	13:10	.	.	21.0	.
080686	13:30	20.0	.	.	.
080686	13:40	.	.	20.0	.
080786	14:10	23.0	.	.	.
080786	14:15	.	.	23.0	.
080886	13:00	20.0	.	.	.
080886	13:15	.	.	.	20.0
081186	13:00	21.0	.	.	.
081186	13:15	.	.	21.0	.
081486	13:00	.	21.0	.	.
081486	13:05	.	.	21.0	.
081586	13:00	.	22.0	.	.
081586	13:10	.	.	21.0	.

TABLE A.1.A
PHYSICAL PARAMETER: TEMPERATURE

DEPTH-113 cm.

DATE	HOOR	QUADRANT 1	QUADRANT 2	QUADRANT 3	QUADRANT 4
081686	13:55	.	.	.	22.0
081686	14:00	.	.	22	.
081786	14:00	21	.	.	.
081786	14:15	.	.	21	.
081886	13:00	.	22	.	.
081886	13:05	.	.	22	.
081986	13:05	.	.	23	.
081986	13:15	.	.	.	23.0
082086	14:00	22	.	.	.
082086	14:10	.	.	.	22.2
082186	13:00	24	.	.	.
082186	13:15	.	.	.	25.0
082286	13:00	.	23	.	.
082286	13:05	.	.	23	.
082686	13:00	21	.	.	.
082686	13:15	.	20	.	.
082786	13:00	.	21	.	.
082786	13:15	.	.	.	21.0
082886	13:30	20	.	.	21.0
082986	13:00	.	19	.	.
082986	13:15	.	.	.	19.0
090186	13:03	18	.	.	.
090186	13:05	.	18	.	.

TABLE A.1.A
PHYSICAL PARAMETER: TEMPERATURE

DEPTH-339 cm.

DATE	HOUR	QUADRANT 1	QUADRANT 2	QUADRANT 3	QUADRANT 4
071686	9:20	16.0	.	.	.
071886	11:30	17.0	18.0	18.0	18.0
080986	13:25	19.6	.	.	.
080986	13:30	.	18.5	.	.
080986	13:35	.	.	19.5	.
080986	13:40	.	.	.	18.7

TABLE A.1.A
PHYSICAL PARAMETER: TEMPERATURE

DEPTH-415 cm.

DATE	HOUR	QUADRANT 1	QUADRANT 2	QUADRANT 3	QUADRANT 4
071886	11:15	15.0	14	16.0	15.0
071986	10:45	15.0	.	16.0	.
072086	12:45	.	15	.	16.0
072186	14:00	16.0	.	16.0	.
072386	14:20	15.0	.	16.0	.
072486	14:30	.	14	16.0	.
072586	13:15	16.0	.	15.0	.
072686	16:18	15.5	.	.	.
072686	16:19	.	14	.	.
072786	14:47	15.0	.	.	.
072786	14:48	.	14	.	.
072886	14:00	.	.	18.0	16.0
072986	15:30	.	16	.	.
072986	15:35	.	.	17.0	.
073086	14:30	.	16	.	.
073086	14:35	.	.	17.0	.
073186	14:20	17.0	15	.	.
080186	14:30	.	17	.	.
080186	14:35	.	.	.	17.0
080286	13:49	.	16	.	.
080286	13:56	.	.	16.8	.
080386	14:10	16.0	.	.	.
080386	14:20	.	.	16.0	.
080486	14:00	.	16	.	.
080486	14:20	.	.	.	16.0
080586	14:00	.	16	.	.
080586	14:15	.	.	16.0	.
080686	13:50	17.0	.	.	.
080686	14:00	.	.	.	16.0
080786	14:00	.	16	.	.
080786	14:05	.	.	18.0	.
080886	14:00	19.0	.	.	.
080886	14:15	.	.	19.0	.
080986	13:50	.	16	.	.
080986	13:55	16.5	.	.	.
080986	14:00	.	.	16.8	.
080986	14:05	.	.	.	16.5
081086	13:10	16.9	.	.	.
081086	13:15	.	.	.	16.5
081186	14:00	.	16	.	.
081186	14:15	.	.	18.0	.
081486	13:10	17.0	.	.	.
081486	13:15	.	.	17.0	.
081586	13:35	.	.	.	17.0
081586	13:45	.	17	.	.
081686	13:30	.	.	.	17.0

TABLE A.1.A
PHYSICAL PARAMETER: TEMPERATURE

DEPTH-415 cm.

DATE	HOUR	QUADRANT 1	QUADRANT 2	QUADRANT 3	QUADRANT 4
081686	13:40	.	16.2	.	.
081786	15:00	17	.	.	.
081786	15:15	.	17.0	.	.
081886	13:10	.	17.0	.	.
081886	13:20	.	.	.	16.0
081986	13:30	17	.	.	.
081986	13:35	.	.	17	.
082086	14:20	.	16.5	.	.
082086	14:30	.	.	.	17.1
082186	13:30	18	.	.	.
082186	13:35	.	.	.	17.0
082286	13:15	.	.	18	.
082286	13:25	.	.	.	19.0
082686	14:00	18	.	.	.
082686	14:15	.	.	19	.
082786	14:00	.	16.0	.	.
082786	14:15	.	.	.	17.0
082886	13:35	16	.	.	.
082886	13:40	.	.	18	.
082986	14:00	16	.	.	.
082986	14:15	.	16.0	.	.
090186	13:30	.	.	17	.
090186	13:35	.	.	.	16.0

TABLE A.1.A
PHYSICAL PARAMETER: TEMPERATURE

DEPTH-INFLOW AND OUTFLOW			
DATE	HOUR	INFLOW TEMPERATURE	OUTFLOW TEMPERATURE
071686	9:30	20.5	.
071886	10:00	22.0	19.0
071986	9:00	21.0	19.0
071986	15:00	22.0	.
072086	13:00	25.0	.
072086	15:30	17.0	.
072186	.	.	18.0
072186	13:00	22.0	.
072186	15:30	18.0	.
072286	11:00	23.0	18.0
072386	13:00	22.0	.
072386	16:00	.	19.0
072486	16:00	22.0	19.0
072586	13:00	25.0	23.0
072686	13:31	28.0	.
072686	13:34	.	20.5
072786	13:21	24.0	19.0
072886	13:00	25.0	20.0
072986	13:00	26.0	21.0
073086	16:00	24.0	20.0
073186	16:00	25.0	23.0
080386	14:00	25.0	23.5
080486	.	23.0	.
080486	16:00	.	21.0
080586	16:00	.	22.0
080586	16:05	28.0	.
080686	16:00	25.0	17.0
080786	13:00	.	19.0
080786	13:05	24.0	.
080886	16:00	22.0	17.0
080986	13:05	.	18.5
080986	13:10	27.0	.
081186	15:00	25.0	19.0
081486	16:00	24.0	20.0
081586	16:00	26.0	22.0
081686	13:10	.	21.5
081686	13:15	27.0	.
081786	15:30	20.0	21.0
081986	15:00	30.0	23.0
082086	15:30	23.2	17.0
082186	13:40	.	21.0
082186	13:45	26.0	.
082286	15:00	26.0	19.0
082686	16:00	26.0	22.0
082786	15:00	24.0	20.0
082886	16:00	.	20.0

TABLE A.1.A
PHYSICAL PARAMETER: TEMPERATURE

DEPTH-INFLOW AND OUTFLOW

DATE	HOUR	INFLOW TEMPERATURE	OUTFLOW TEMPERATURE
082886	16:15	24	.
082986	14:30	19	16
090186	16:15	23	17

TABLE A.1.B
PHYSICAL PARAMETER: FLOW RATE

SAMPLE LOCATION	SAMPLING DATE	SAMPLING HOUR	FLOW RATE (mL/min)
INFLOW	071686	8:00	190
INFLOW	071686	9:30	200
INFLOW	071786	8:30	190
INFLOW	071786	9:30	200
INFLOW	071886	10:00	202
INFLOW	071886	12:00	201
INFLOW	071986	9:00	205
INFLOW	071986	15:00	200
INFLOW	072086	13:00	360
INFLOW	072086	15:30	360
INFLOW	072186	13:00	330
INFLOW	072186	15:30	200
INFLOW	072286	11:00	360
INFLOW	072286	16:00	.
INFLOW	072386	13:00	375
INFLOW	072386	16:00	.
INFLOW	072486	16:00	310
INFLOW	072586	13:00	.
INFLOW	072686	13:31	322
INFLOW	072786	13:21	329
INFLOW	072886	13:00	340
INFLOW	072986	13:00	300
INFLOW	073086	16:00	335
INFLOW	073186	16:00	345
INFLOW	080186	16:00	345
INFLOW	080286	.	345
INFLOW	080386	14:00	200
INFLOW	080486	.	340
INFLOW	080586	16:05	345
INFLOW	080686	16:00	350
INFLOW	080786	13:05	315
INFLOW	080886	16:00	350
INFLOW	080986	13:10	335
INFLOW	081086	13:23	210
INFLOW	081186	15:00	340
INFLOW	081286	15:00	340
INFLOW	081386	16:00	340
INFLOW	081486	16:00	0.00
INFLOW	081586	16:00	345
INFLOW	081686	13:15	350
INFLOW	081786	15:30	325
INFLOW	081886	16:15	330
INFLOW	081986	15:00	330
INFLOW	082086	15:30	335
INFLOW	082086	15:30	335
INFLOW	082186	13:45	335

TABLE A.1.B
PHYSICAL PARAMETER: FLOW RATE

SAMPLE LOCATION	SAMPLING DATE	SAMPLING HOUR	FLOW RATE (mL/min)
INFLOW	082186	13:45	335
INFLOW	082286	15:00	335
INFLOW	082286	15:00	335
INFLOW	082686	16:00	330
INFLOW	082686	16:00	330
INFLOW	082786	15:00	340
INFLOW	082786	15:00	340
INFLOW	082886	16:15	335
INFLOW	082886	16:15	335
INFLOW	082986	14:30	340
INFLOW	082986	14:30	340
INFLOW	090186	16:15	340
INFLOW	090186	16:15	340
OUTFLOW	071686	9:30	200
OUTFLOW	071786	15:00	210
OUTFLOW	071886	10:00	198
OUTFLOW	071986	9:00	360
OUTFLOW	072086	13:00	220
OUTFLOW	072186	.	.
OUTFLOW	072286	11:00	200
OUTFLOW	072386	16:00	200
OUTFLOW	072486	16:00	205
OUTFLOW	072586	13:00	210
OUTFLOW	072686	13:34	248
OUTFLOW	072786	13:21	204
OUTFLOW	072886	13:00	195
OUTFLOW	072986	13:00	200
OUTFLOW	073086	16:00	200
OUTFLOW	073186	16:00	195
OUTFLOW	080186	16:00	200
OUTFLOW	080286	.	185
OUTFLOW	080386	14:00	345
OUTFLOW	080486	16:00	200
OUTFLOW	080586	16:00	200
OUTFLOW	080686	16:00	200
OUTFLOW	080786	13:00	200
OUTFLOW	080886	16:00	195
OUTFLOW	080986	13:05	200
OUTFLOW	081086	13:22	340
OUTFLOW	081186	15:00	200
OUTFLOW	081286	15:50	195
OUTFLOW	081386	16:00	210
OUTFLOW	081486	16:00	220
OUTFLOW	081586	16:00	198
OUTFLOW	081686	13:10	190
OUTFLOW	081786	15:30	190

TABLE A.1.B
PHYSICAL PARAMETER: FLOW RATE

SAMPLE LOCATION	SAMPLING DATE	SAMPLING HOUR	FLOW RATE (mL/min)
OUTFLOW	081886	16:15	200
OUTFLOW	081986	15:00	190
OUTFLOW	082086	15:30	219
OUTFLOW	082086	15:30	219
OUTFLOW	082186	13:40	210
OUTFLOW	082186	13:40	210
OUTFLOW	082286	15:00	200
OUTFLOW	082286	15:00	200
OUTFLOW	082686	16:00	200
OUTFLOW	082686	16:00	200
OUTFLOW	082786	15:00	210
OUTFLOW	082786	15:00	210
OUTFLOW	082886	16:00	200
OUTFLOW	082886	16:00	200
OUTFLOW	082986	14:30	190
OUTFLOW	082986	14:30	190
OUTFLOW	090186	16:15	220
OUTFLOW	090186	16:15	220

Appendix B

Chemical Parameters

TABLE B.1.A
CHEMICAL PARAMETERS: pH, Eh, O2

DEPTH-0 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	pH	Eh (mV)	O2 (mg/L)
071686	9:30	INFLOW	7.85	.	6.10
071786	9:30	INFLOW	7.85	.	5.80
071886	12:00	INFLOW	7.65	252	5.90
072086	15:30	INFLOW	7.79	155	3.80
072486	16:00	INFLOW	7.69	190	5.60
072586	13:00	INFLOW	7.62	183	5.70
072686	13:31	INFLOW	7.66	190	5.30
072786	13:21	INFLOW	7.74	210	5.10
072886	13:00	INFLOW	7.62	193	5.20
073086	16:00	INFLOW	7.62	198	4.90
080186	16:00	INFLOW	7.65	190	4.80
080386	14:00	INFLOW	7.65	170	4.60
080686	16:00	INFLOW	7.60	190	4.80
080886	16:00	INFLOW	7.50	221	4.70
081186	15:00	INFLOW	7.50	211	4.40
081386	16:00	INFLOW	7.69	165	5.20
081586	16:00	INFLOW	7.42	184	4.00
081886	16:15	INFLOW	7.20	180	3.40
082286	15:00	INFLOW	7.68	160	3.10
082786	15:00	INFLOW	6.60	225	3.70

DEPTH-113 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	pH	Eh (mV)	O2 (mg/L)
072186	13:00	B7Q1	7.65	210	6.70
072386	14:00	B7Q1	7.60	179	4.80
072486	13:50	B7Q1	7.70	159	4.50
072586	13:10	B7Q1	7.60	147	4.50
072686	15:02	B7Q1	7.60	140	3.10
072786	13:56	B7Q1	7.75	140	3.80
072886	13:30	B7Q1	7.66	159	3.50
073086	13:35	B7Q1	7.52	132	4.10
080186	13:30	B7Q1	7.65	140	4.10
080386	13:30	B7Q1	7.59	120	3.90
080686	13:30	B7Q1	7.55	152	3.50
080886	13:00	B7Q1	7.49	120	2.30
081186	13:00	B7Q1	7.52	152	1.90
071786	.	B7Q2	7.73	.	6.10
071986	10:30	B7Q2	7.67	255	5.90
072286	13:00	B7Q2	7.63	179	5.00
072586	13:30	B7Q2	7.55	150	4.90

TABLE B.1.A
CHEMICAL PARAMETERS: pH, Eh, O2

DEPTH=113 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	pH	Eh (mV)	O2 (mg/L)
072886	13:45	B7Q2	7.71	149	3.70
080186	13:35	B7Q2	7.65	130	3.90
081386	13:00	B7Q2	7.52	140	2.10
081586	13:00	B7Q2	7.45	129	2.10
081886	13:00	B7Q2	7.12	148	3.50
082286	13:00	B7Q2	7.10	152	2.20
082786	13:00	B7Q2	6.72	210	2.10
071686	9:15	B7Q3	7.66	.	6.50
071786	.	B7Q3	7.70	.	5.90
071986	10:30	B7Q3	7.75	252	6.60
072086	12:30	B7Q3	7.55	250	6.40
072486	14:00	B7Q3	7.65	149	3.20
072686	14:25	B7Q3	7.68	130	2.90
072786	14:24	B7Q3	7.75	126	2.90
080686	13:40	B7Q3	7.58	149	2.40
081186	13:15	B7Q3	7.53	160	1.90
081586	13:10	B7Q3	7.50	120	2.50
081886	13:05	B7Q3	7.40	150	3.20
082286	13:05	B7Q3	7.00	160	2.40
071686	9:15	B7Q4	7.70	.	6.10
072186	13:15	B7Q4	7.63	192	4.90
072286	13:15	B7Q4	7.68	173	3.20
072386	14:00	B7Q4	7.53	143	3.30
073086	13:50	B7Q4	7.54	129	3.30
080386	13:25	B7Q4	7.60	100	2.00
080886	13:15	B7Q4	7.55	160	1.70
081386	13:10	B7Q4	7.69	130	2.00
082786	13:15	B7Q4	6.51	212	2.20

DEPTH=415 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	pH	Eh (mV)	O2 (mg/L)
071686	9:25	B3Q1	7.63	.	.
071886	11:15	B3Q1	7.65	250	7.50
071986	10:45	B3Q1	7.50	282	7.90
072186	14:00	B3Q1	7.50	236	6.10
072386	14:20	B3Q1	7.42	189	6.10
073086	14:20	B3Q1	7.48	130	5.60
080686	13:50	B3Q1	7.50	146	4.70
080886	14:00	B3Q1	7.52	181	4.90
081386	13:20	B3Q1	7.70	135	5.30

TABLE B.1.A
CHEMICAL PARAMETERS: pH, Eh, O2

DEPTH=415 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	pH	Eh (mV)	O2 (mg/L)
071686	9:25	B3Q2	7.60	.	.
071786	.	B3Q2	7.58	.	8.80
071886	11:15	B3Q2	7.64	250	7.50
071986	.	B3Q2	7.54	282	7.20
072086	12:45	B3Q2	7.58	250	9.10
080186	14:30	B3Q2	7.49	165	7.90
080386	14:15	B3Q2	7.58	168	8.20
081186	14:00	B3Q2	7.45	172	7.80
081586	13:45	B3Q2	7.40	133	7.30
081886	13:10	B3Q2	7.00	149	6.90
082786	14:00	B3Q2	6.54	200	7.50
071786	.	B3Q3	7.54	.	8.40
071886	11:15	B3Q3	7.55	.	7.40
072186	14:00	B3Q3	7.53	238	8.30
072386	14:20	B3Q3	7.55	200	6.40
080886	14:15	B3Q3	7.50	190	7.50
081186	14:15	B3Q3	7.19	176	7.00
082286	13:15	B3Q3	7.50	135	6.50
071786	.	B3Q4	7.44	.	5.80
071886	11:15	B3Q4	7.54	255	5.40
072086	12:45	B3Q4	7.53	249	6.10
073086	14:45	B3Q4	7.66	124	4.30
080186	14:35	B3Q4	7.51	135	2.90
080386	14:30	B3Q4	7.53	112	3.40
080686	14:00	B3Q4	7.49	151	3.60
081386	13:25	B3Q4	7.57	135	3.20
081586	13:35	B3Q4	7.30	123	3.60
081886	13:20	B3Q4	7.13	130	3.40
082286	13:25	B3Q4	7.29	160	4.90
082786	14:15	B3Q4	6.85	210	3.30

DEPTH=550 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	pH	Eh (mV)	O2 (mg/L)
071686	9:30	OUTFLOW	7.83	.	5.70
071786	15:00	OUTFLOW	7.70	.	5.30
071886	10:00	OUTFLOW	7.65	252	5.00
071986	9:00	OUTFLOW	7.76	280	5.60
072086	13:00	OUTFLOW	7.68	242	6.60
072186	.	OUTFLOW	7.61	229	6.40
072386	16:00	OUTFLOW	7.63	189	5.30

TABLE B.1.A
CHEMICAL PARAMETERS: pH, Eh, O₂

DEPTH-550 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	pH	Eh (mV)	O ₂ (mg/L)
072886	13:00	OUTFLOW	7.61	149	4.60
073086	16:00	OUTFLOW	7.60	112	3.60
080186	16:00	OUTFLOW	7.50	109	2.90
080386	14:00	OUTFLOW	7.54	100	2.90
080686	16:00	OUTFLOW	7.08	149	3.10
080886	16:00	OUTFLOW	7.60	203	3.20
081186	15:00	OUTFLOW	7.39	172	3.90
081386	16:00	OUTFLOW	7.62	170	3.60
081586	16:00	OUTFLOW	7.50	109	3.90
081886	16:15	OUTFLOW	7.60	169	3.50
082286	15:00	OUTFLOW	7.58	110	3.80
082786	15:00	OUTFLOW	7.20	195	3.30

TABLE B.1.B
CHEMICAL PARAMETERS: TRACER CONCENTRATIONS

DEPTH=0 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	IODIDE (mg/L)	SD +/-	STRONTIUM (mg/L)	SD +/-
071686	9:30	INFLOW	<.1	.	0.21	0
071986	15:00	INFLOW	118	5	76	6
072086	15:30	INFLOW	115	5	78	4
072186	15:30	INFLOW	114	5	76	6
072286	16:00	INFLOW	117	5	74	6
072386	16:00	INFLOW	112	5	78	4
072486	16:00	INFLOW	.1	0	.	.

DEPTH=036 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	IODIDE (mg/L)	SD +/-	STRONTIUM (mg/L)	SD +/-
071686	9:00	B8Q1	<.1	.	0.24	0
071786	.	B8Q1	<.1	.	0.23	0
071886	12:00	B8Q1	<.1	.	0.26	0
071986	14:45	B8Q1	52	3	5.70	0
072086	13:00	B8Q1	96	4	22	1
072186	15:30	B8Q1	108	5	35	2
072286	13:00	B8Q1	109	4	49	5
072386	15:15	B8Q1	102	5	60	8
072486	13:30	B8Q1	98	5	.	.
072586	14:50	B8Q1	47	2	55	3
072686	16:45	B8Q1	6.8	0	.	.
072786	15:28	B8Q1	1.5	0	.	.
072886	13:00	B8Q1	.7	0	18	1
072986	14:00	B8Q1	.4	0	.	.
073086	15:00	B8Q1	.4	0	8.60	1
080186	13:05	B8Q1	.3	0	4.50	1
080486	13:25	B8Q1	.	.	1.70	0
080686	13:15	B8Q1	.	.	1.10	0
080886	14:45	B8Q1	.	.	0.77	0
081186	14:25	B8Q1	.	.	0.60	0
081386	14:20	B8Q1	.	.	0.55	0
081586	14:15	B8Q1	.	.	0.46	0
081886	14:20	B8Q1	<.1	.	0.34	0
082086	14:40	B8Q1	.	.	0.28	0
082286	14:50	B8Q1	.	.	0.34	0
082586	14:20	B8Q1	.	.	0.39	0
082786	14:25	B8Q1	.	.	0.42	0
082986	14:00	B8Q1	.	.	0.37	0
090186	14:15	B8Q1	.	.	0.38	0
071686	9:00	B8Q2	<.1	.	0.20	0

TABLE B.1.B
CHEMICAL PARAMETERS: TRACER CONCENTRATIONS

DEPTH-036 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	IODIDE (mg/L)	SD +/-	STRONTIUM (mg/L)	SD +/-
071786	.	B8Q2	<.1	.	0.23	0
071886	12:00	B8Q2	<.1	.	0.22	0
071986	14:45	B8Q2	78	4	19	2
072086	13:00	B8Q2	107	5	32	2
072186	15:30	B8Q2	110	5	51	2
072286	13:00	B8Q2	107	4	68	2
072386	15:15	B8Q2	106	5	70	3
072486	13:30	B8Q2	90	5	.	.
072586	14:50	B8Q2	26	2	42	3
072686	16:46	B8Q2	1.8	0	.	.
072786	15:30	B8Q2	.4	0	.	.
072886	13:00	B8Q2	.2	0	11.6	1
072986	14:00	B8Q2	.1	0	.	.
073086	15:05	B8Q2	.2	0	3.30	0
080186	13:15	B8Q2	<.1	.	1.50	0
080486	13:26	B8Q2	.	.	0.47	0
080686	13:20	B8Q2	.	.	0.33	0
080886	14:45	B8Q2	.	.	0.32	0
081186	14:20	B8Q2	.	.	0.30	0
081386	14:20	B8Q2	.	.	0.30	0
081586	14:17	B8Q2	.	.	0.25	0
081886	14:20	B8Q2	<.1	.	0.24	0
082086	14:40	B8Q2	.	.	0.24	0
082286	14:50	B8Q2	.	.	0.22	0
082586	14:30	B8Q2	.	.	0.29	0
082786	14:25	B8Q2	.	.	0.26	0
082986	14:00	B8Q2	.	.	0.27	0
090186	14:15	B8Q2	.	.	0.22	0
071686	9:05	B8Q3	<.1	.	0.16	0
071786	.	B8Q3	<.1	.	0.21	0
071886	12:00	B8Q3	<.1	.	0.28	0
071986	14:45	B8Q3	43	2	0.43	0
072086	13:00	B8Q3	108	5	9.60	1
072186	15:30	B8Q3	111	5	29	2
072286	13:00	B8Q3	111	5	49	2
072386	15:15	B8Q3	106	5	76	6
072486	13:30	B8Q3	102	5	.	.
072586	14:50	B8Q3	48	3	68	2
072686	16:46	B8Q3	1.3	0	.	.
072786	15:28	B8Q3	.2	0	.	.
072886	13:00	B8Q3	.1	0	14	1
073086	15:15	B8Q3	<.1	.	3.00	0
080186	13:10	B8Q3	<.1	.	1.10	0
080486	13:27	B8Q3	.	.	0.59	0

TABLE B.1.B
CHEMICAL PARAMETERS: TRACER CONCENTRATIONS

DEPTH=036 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	IODIDE (mg/L)	SD +/-	STRONTIUM (mg/L)	SD +/-
080686	13:15	B8Q3		.	0.41	0
080886	14:50	B8Q3		.	0.36	0
081186	14:30	B8Q3		.	0.33	0
081386	14:20	B8Q3		.	0.34	0
081586	14:17	B8Q3		.	0.29	0
081886	14:10	B8Q3	<.1	.	0.24	0
082086	14:45	B8Q3		.	0.22	0
082286	14:50	B8Q3		.	0.24	0
082586	14:20	B8Q3		.	0.28	0
082786	14:22	B8Q3		.	0.28	0
082986	14:00	B8Q3		.	0.28	0
090186	14:15	B8Q3		.	0.28	0
071686	9:05	B8Q4	<.1	.	0.15	0
071786	.	B8Q4	<.1	.	0.19	0
071886	12:00	B8Q4	<.1	.	0.25	0
071986	14:45	B8Q4	34	2	1.70	0
072086	13:00	B8Q4	104	5	9.80	1
072186	15:30	B8Q4	111	5	28	2
072286	13:00	B8Q4	113	5	44	2
072386	15:15	B8Q4	108	5	60	4
072486	13:30	B8Q4	102	5	.	.
072586	14:50	B8Q4	74	4	68	2
072686	16:46	B8Q4	8.3	1	.	.
072786	15:29	B8Q4	.6	0	.	.
072886	13:00	B8Q4	.4	0	39	2
072986	14:00	B8Q4	.2	0	.	.
073086	15:20	B8Q4	.3	0	20	1
080186	13:15	B8Q4	.2	0	6.30	1
080486	13:28	B8Q4		.	1.80	0
080686	13:17	B8Q4		.	1.02	0
080886	14:50	B8Q4		.	0.69	0
081186	14:25	B8Q4		.	0.50	0
081386	14:20	B8Q4		.	0.42	0
081586	14:17	B8Q4		.	0.36	0
081886	14:27	B8Q4	<.1	.	0.29	0
082086	14:45	B8Q4		.	0.31	0
082286	14:50	B8Q4		.	0.25	0
082586	14:25	B8Q4		.	0.29	0
082786	14:25	B8Q4		.	0.30	0
082986	14:00	B8Q4		.	0.38	0
090186	14:15	B8Q4		.	0.27	0

TABLE B.1.B
CHEMICAL PARAMETERS: TRACER CONCENTRATIONS

DEPTH-113 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	IODIDE (mg/L)	SD +/-	STRONTIUM (mg/L)	SD +/-
071686	9:10	B7Q1	<.1	.	0.23	0
071886	11:45	B7Q1	<.1	.	0.23	0
071986	10:30	B7Q1	.12	10	0.26	0
072086	12:30	B7Q1	.3	0	0.22	0
072186	13:00	B7Q1	2.2	0	0.34	0
072286	13:15	B7Q1	6.2	0	0.48	0
072386	14:00	B7Q1	5.3	0	1.02	0
072486	13:50	B7Q1	7.1	0	.	.
072586	13:10	B7Q1	10.9	1	2.20	0
072686	15:02	B7Q1	18	1	.	.
072786	13:56	B7Q1	8.9	1	.	.
072886	13:30	B7Q1	6.7	0	3.10	0
072986	13:50	B7Q1	4.5	1	.	.
073086	13:35	B7Q1	7.4	0	.	.
080186	13:30	B7Q1	7.6	0	4.50	0
080286	13:00	B7Q1	9.9	0	.	.
080386	13:30	B7Q1	14.8	1	.	.
080486	13:00	B7Q1	16.4	1	3.10	0
080586	13:20	B7Q1	19	1	.	.
080686	13:30	B7Q1	29	1	1.80	0
080786	14:10	B7Q1	31	3	.	.
080886	13:00	B7Q1	32	3	2.70	0
081186	13:00	B7Q1	34	2	2.28	0
081386	13:30	B7Q1	32	2	1.70	0
081586	13:00	B7Q1	24	1	1.57	0
081886	13:00	B7Q1	8	1	1.91	0
082086	14:00	B7Q1	1.7	0	1.99	0
082286	13:00	B7Q1	1.6	0	1.43	0
082586	13:15	B7Q1	.7	0	1.50	0
082786	13:35	B7Q1	.4	0	3.70	0
082986	13:00	B7Q1	.3	0	3.70	1
090186	13:03	B7Q1	.2	0	3.20	0
071686	9:10	B7Q2	<.1	.	0.21	0
071886	11:45	B7Q2	<.1	.	0.21	0
071986	10:30	B7Q2	<.1	.	0.20	0
072086	13:00	B7Q2	.3	0	0.21	0
072186	15:30	B7Q2	2.4	0	0.22	0
072286	13:00	B7Q2	5.3	0	0.31	0
072386	13:00	B7Q2	5.3	0	0.53	0
072486	14:00	B7Q2	5.9	0	.	.
072586	13:30	B7Q2	6.8	1	1.00	0
072686	15:31	B7Q2	8.5	1	.	.
072786	14:21	B7Q2	9.1	1	.	.
072886	13:45	B7Q2	12.6	1	4.50	0

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TABLE B.1.B
CHEMICAL PARAMETERS: TRACER CONCENTRATIONS

DEPTH=113 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	IODIDE (mg/L)	SD +/-	STRONTIUM (mg/L)	SD +/-
072986	14:10	B7Q2	17	2	.	.
073086	13:30	B7Q2	31	1	.	.
080186	13:35	B7Q2	41	2	4.00	0
080286	13:08	B7Q2	38	2	.	.
080386	13:40	B7Q2	43	2	.	.
080486	13:15	B7Q2	40	2	3.70	0
080586	13:00	B7Q2	36	2	.	.
080686	13:50	B7Q2	36	2	2.90	0
080786	13:15	B7Q2	27	3	.	.
080886	13:35	B7Q2	18	2	1.80	0
081186	13:20	B7Q2	9.8	1	1.10	0
081386	13:00	B7Q2	5.6	0	0.86	0
081586	13:00	B7Q2	3.5	0	1.15	0
081886	13:00	B7Q2	1.4	0	2.18	0
082086	13:45	B7Q2	1.6	0	2.96	0
082286	13:00	B7Q2	1.1	0	3.07	0
082586	13:20	B7Q2	.7	0	3.40	0
082786	13:00	B7Q2	.6	0	5.80	1
082986	13:00	B7Q2	.7	0	7.50	1
090186	13:05	B7Q2	.2	0	9.00	1
071686	9:15	B7Q3	<.1	.	0.20	0
071886	11:45	B7Q3	<.1	.	0.21	0
071986	10:30	B7Q3	<.1	.	0.19	0
072086	12:30	B7Q3	<.1	.	0.21	0
072186	15:30	B7Q3	2.0	0	0.31	0
072286	13:30	B7Q3	12.5	1	1.50	0
072386	13:00	B7Q3	14.6	1	2.70	0
072486	14:00	B7Q3	16.2	1	.	.
072586	13:45	B7Q3	12.6	1	3.90	0
072686	14:25	B7Q3	17	1	.	.
072786	14:24	B7Q3	21	1	.	.
072886	14:10	B7Q3	27	2	3.00	0
072986	14:10	B7Q3	30	3	.	.
073086	13:35	B7Q3	41	2	.	.
080186	14:05	B7Q3	43	2	4.60	0
080286	13:08	B7Q3	38	2	.	.
080386	13:45	B7Q3	42	2	.	.
080486	14:15	B7Q3	36	2	2.90	0
080586	13:10	B7Q3	32	2	.	.
080686	13:40	B7Q3	33	2	1.96	0
080786	14:15	B7Q3	23	2	.	.
080886	13:35	B7Q3	15	2	0.80	0
081186	13:15	B7Q3	9.1	1	2.10	0
081386	13:40	B7Q3	5.0	0	7.00	0

TABLE B.1.B
CHEMICAL PARAMETERS: TRACER CONCENTRATIONS

DEPTH-113 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	IODIDE (mg/L)	SD +/-	STRONTIUM (mg/L)	SD +/-
081586	13:10	B7Q3	1.9	0	11	1
081886	13:05	B7Q3	.5	0	6.70	0
082086	13:45	B7Q3	.3	0	8.40	0
082286	13:05	B7Q3	.2	0	7.69	0
082586	13:35	B7Q3	.1	0	15.5	0
082786	13:35	B7Q3	<.1	.	11.3	1
082986	13:20	B7Q3	<.1	.	9.40	0
090186	13:20	B7Q3	<.1	.	14.1	1
071686	9:15	B7Q4	<.1	.	0.20	0
071886	11:45	B7Q4	<.1	.	0.19	0
071986	10:30	B7Q4	<.1	.	0.20	0
072086	14:00	B7Q4	2.1	0	0.24	0
072186	13:15	B7Q4	7.1	0	1.00	0
072286	13:15	B7Q4	25	1	6.20	0
072386	14:00	B7Q4	22	1	9.70	1
072486	14:10	B7Q4	26	1	.	.
072586	13:45	B7Q4	22	1	11.1	0
072686	15:14	B7Q4	11.3	1	.	.
072786	14:42	B7Q4	8.9	1	.	.
072886	14:15	B7Q4	12.2	1	3.10	0
072986	14:15	B7Q4	16	1	.	.
073086	13:50	B7Q4	27	1	.	.
080186	14:00	B7Q4	33	2	3.20	0
080286	13:12	B7Q4	38	2	.	.
080386	13:25	B7Q4	43	2	.	.
080486	14:22	B7Q4	47	3	2.70	0
080586	13:30	B7Q4	49	2	.	.
080686	14:15	B7Q4	52	2	1.67	0
080786	13:30	B7Q4	42	5	.	.
080886	13:15	B7Q4	32	3	1.70	0
081186	13:20	B7Q4	20	1	1.80	0
081386	13:10	B7Q4	9.2	0	1.70	0
081586	13:20	B7Q4	4.8	0	2.20	0
081886	13:15	B7Q4	2.1	0	.	.
082086	14:10	B7Q4	1.2	0	3.38	0
082286	13:45	B7Q4	1.1	0	3.50	0
082586	13:35	B7Q4	.5	0	6.10	0
082786	13:15	B7Q4	.4	0	4.00	0
082986	13:15	B7Q4	.4	0	6.30	0
090186	13:20	B7Q4	.2	0	7.60	0

TABLE B.1.B
CHEMICAL PARAMETERS: TRACER CONCENTRATIONS

DEPTH-339 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	IODIDE (mg/L)	SD +/-	STRONTIUM (mg/L)	SD +/-
071686	9:20	B5Q1	<.1	.	0.22	0
072486	14:25	B5Q1	.1	0	.	.
080886	14:00	B5Q1	.1	0	.	.
080986	13:25	B5Q1	.4	0	.	.
081086	.	B5Q1	.4	0	.	.
081186	13:50	B5Q1	.8	0	.	.
081286	13:45	B5Q1	.9	0	.	.
081386	13:50	B5Q1	1.4	0	.	.
081486	13:00	B5Q1	2.0	0	.	.
081586	13:30	B5Q1	1.9	0	.	.
081886	13:35	B5Q1	2.3	0	.	.
082086	13:50	B5Q1	3.2	0	.	.
082286	14:30	B5Q1	2.9	0	.	.
082586	13:45	B5Q1	3.0	0	.	.
082786	13:45	B5Q1	4.4	0	.	.
082986	13:28	B5Q1	6.4	1	.	.
090186	13:20	B5Q1	7.7	1	.	.
071686	9:20	B5Q2	<.1	.	0.27	0
071686	9:20	B5Q3	<.1	.	0.25	0
072486	.	B5Q3	1.2	0	.	.
072586	14:05	B5Q3	2.8	0	.	.
072686	16:04	B5Q3	8.3	1	.	.
072786	15:04	B5Q3	5.2	0	.	.
072886	14:45	B5Q3	4.7	0	.	.
072986	14:20	B5Q3	5.6	1	.	.
073086	14:10	B5Q3	6.3	0	.	.
080186	14:20	B5Q3	6.2	0	.	.
080286	13:33	B5Q3	6.1	0	.	.
080386	13:50	B5Q3	12.9	0	.	.
080486	15:00	B5Q3	7.5	0	.	.
080586	13:50	B5Q3	10.5	1	.	.
080686	14:30	B5Q3	10.8	1	.	.
080786	13:50	B5Q3	8.9	1	.	.
080886	14:05	B5Q3	6.5	1	.	.
080986	13:35	B5Q3	12.1	1	.	.
081086	.	B5Q3	9.0	1	.	.
081186	14:00	B5Q3	12.3	1	.	.
081286	13:45	B5Q3	9.5	0	.	.
081386	13:55	B5Q3	11.5	1	.	.
081486	13:00	B5Q3	6.7	0	.	.
081586	13:40	B5Q3	8.9	0	.	.
081886	13:45	B5Q3	7.1	1	.	.
082086	13:55	B5Q3	6.7	1	.	.
082286	14:25	B5Q3	6.5	1	.	.

TABLE B.1.B
CHEMICAL PARAMETERS: TRACER CONCENTRATIONS

DEPTH-339 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	IODIDE (mg/L)	SD +/-	STRONTIUM (mg/L)	SD +/-
082586	13:50	B5Q3	9.2	1	.	.
082786	13:55	B5Q3	13	1	.	.
082986	13:35	B5Q3	13	1	.	.
090186	13:35	B5Q3	14	1	.	.
071686	9:20	B5Q4	<.1	.	0.23	0
071886	11:30	B5Q4	.	.	0.24	0
072486	14:40	B5Q4	9.4	0	.	.
072586	14:10	B5Q4	8.8	1	.	.
072686	16:01	B5Q4	12.3	1	.	.
072786	15:08	B5Q4	15	1	.	.
072886	14:50	B5Q4	13	1	.	.
072986	14:30	B5Q4	12	1	.	.
073086	14:15	B5Q4	13.7	1	.	.
080186	14:25	B5Q4	12.1	1	.	.
080286	13:36	B5Q4	14.3	1	.	.
080386	13:50	B5Q4	16.2	1	.	.
080486	15:00	B5Q4	12.9	1	.	.
080586	13:55	B5Q4	14.7	1	.	.
080686	14:35	B5Q4	15.3	1	.	.
080786	13:50	B5Q4	14	2	.	.
080886	14:10	B5Q4	13	2	.	.
080986	13:40	B5Q4	14.7	1	.	.
081086	.	B5Q4	12.9	1	.	.
081186	14:00	B5Q4	12.5	1	.	.
081286	13:45	B5Q4	10.2	1	.	.
081386	.	B5Q4	10.0	1	.	.
081486	13:00	B5Q4	7.8	0	.	.
081586	14:00	B5Q4	7.4	0	.	.
081886	13:55	B5Q4	5.3	1	.	.
082086	13:55	B5Q4	4.4	1	.	.
082286	15:05	B5Q4	2.3	0	.	.
082586	14:05	B5Q4	1.5	0	.	.
082786	13:55	B5Q4	1.1	0	.	.
082986	13:50	B5Q4	1.0	0	.	.
090186	14:00	B5Q4	1.7	0	.	.

TABLE B.1.B
CHEMICAL PARAMETERS: TRACER CONCENTRATIONS

DEPTH=415 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	IODIDE (mg/L)	SD +/-	STRONTIUM (mg/L)	SD +/-
071686	9:25	B3Q1	<.1	.	0.32	0
072886	15:00	B3Q1	5.6	0	.	.
072986	15:00	B3Q1	7.9	1	.	.
073086	14:20	B3Q1	12.1	1	.	.
080186	14:30	B3Q1	9.9	1	.	.
080286	13:47	B3Q1	10.8	0	.	.
080386	14:10	B3Q1	11.0	0	.	.
080486	15:30	B3Q1	9.2	0	.	.
080586	13:55	B3Q1	14.8	1	.	.
080686	13:50	B3Q1	13.6	1	.	.
080786	14:10	B3Q1	11	1	.	.
080886	14:00	B3Q1	12	2	.	.
080986	13:55	B3Q1	13.0	1	.	.
081086	13:10	B3Q1	11.6	1	.	.
081186	13:40	B3Q1	11.5	1	.	.
081286	14:00	B3Q1	13.1	1	.	.
081386	13:20	B3Q1	10.6	1	.	.
081486	13:10	B3Q1	9.0	0	.	.
081586	13:55	B3Q1	11.2	1	.	.
081686	13:35	B3Q1	.	.	11	1
081786	15:00	B3Q1	11	1	.	.
081886	13:35	B3Q1	6.2	1	.	.
081986	13:30	B3Q1	10	1	.	.
082086	14:00	B3Q1	5.4	1	.	.
082186	13:30	B3Q1	4.9	1	.	.
082286	14:05	B3Q1	4.0	0	.	.
082586	14:00	B3Q1	6.1	1	.	.
082686	14:00	B3Q1	3.8	0	.	.
082786	14:05	B3Q1	5.5	1	.	.
082886	13:35	B3Q1	3.0	0	.	.
082986	14:00	B3Q1	2.7	0	.	.
090186	13:50	B3Q1	2.4	0	.	.
071686	9:25	B3Q2	<.1	.	0.28	0
080486	14:00	B3Q2	.1	0	.	.
080686	14:00	B3Q2	.3	0	.	.
080786	14:00	B3Q2	.3	0	.	.
080886	14:10	B3Q2	.3	0	.	.
080986	13:50	B3Q2	.6	0	.	.
081086	.	B3Q2	.7	0	.	.
081186	14:00	B3Q2	.5	0	.	.
081286	13:50	B3Q2	1.4	0	.	.
081386	14:00	B3Q2	1.5	0	.	.
081486	13:00	B3Q2	1.2	0	.	.
081586	13:45	B3Q2	1.2	0	.	.

TABLE B.1.B
CHEMICAL PARAMETERS: TRACER CONCENTRATIONS

DEPTH-415 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	IODIDE (mg/L)	SD +/-	STRONTIUM (mg/L)	SD +/-
081686	13:40	B3Q2	1.9	0	.	.
081786	15:15	B3Q2	3.2	1	.	.
081886	13:10	B3Q2	1.5	0	.	.
081986	13:15	B3Q2	3.7	0	.	.
082086	14:20	B3Q2	2.1	0	.	.
082186	9:30	B3Q2	2.6	0	.	.
082286	13:55	B3Q2	2.8	0	.	.
082586	13:55	B3Q2	4.0	0	.	.
082686	14:45	B3Q2	2.0	0	.	.
082786	14:00	B3Q2	3.9	0	.	.
082886	13:50	B3Q2	2.7	0	.	.
082986	14:15	B3Q2	2.3	0	.	.
090186	13:45	B3Q2	2.8	0	.	.
071686	9:25	B3Q3	<.1	.	0.29	0
072986	15:35	B3Q3	.2	0	.	.
073086	14:35	B3Q3	.5	0	.	.
080186	15:00	B3Q3	.8	0	.	.
080286	13:56	B3Q3	1.0	0	.	.
080386	14:20	B3Q3	1.5	0	.	.
080486	14:10	B3Q3	1.1	0	.	.
080586	14:15	B3Q3	1.6	0	.	.
080686	14:20	B3Q3	2.8	0	.	.
080786	14:05	B3Q3	1.9	0	.	.
080886	14:15	B3Q3	1.7	0	.	.
080986	14:00	B3Q3	2.2	0	.	.
081086	.	B3Q3	2.0	0	.	.
081186	14:15	B3Q3	1.6	0	.	.
081286	14:15	B3Q3	2.9	0	.	.
081386	14:00	B3Q3	2.5	0	.	.
081486	13:15	B3Q3	2.4	0	.	.
081586	14:45	B3Q3	1.9	0	.	.
081686	13:55	B3Q3	1.0	0	.	.
081786	15:05	B3Q3	3.0	0	.	.
081886	13:30	B3Q3	1.7	0	.	.
081986	13:35	B3Q3	1.9	0	.	.
082086	14:10	B3Q3	1.7	0	.	.
082186	9:30	B3Q3	2.1	0	.	.
082286	13:15	B3Q3	1.6	0	.	.
082586	15:50	B3Q3	2.7	0	.	.
082686	14:15	B3Q3	2.1	0	.	.
082786	14:50	B3Q3	1.8	0	.	.
082886	13:40	B3Q3	2.0	0	.	.
082986	14:20	B3Q3	2.1	0	.	.
090186	13:30	B3Q3	2.0	0	.	.

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TABLE B.1.B
CHEMICAL PARAMETERS: TRACER CONCENTRATIONS

DEPTH=415 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	IODIDE (mg/L)	SD +/-	STRONTIUM (mg/L)	SD +/-
071686	9:25	B3Q4	<.1	.	0.32	0
072886	14:00	B3Q4	19	2	.	.
072986	15:05	B3Q4	16	1	.	.
073086	14:45	B3Q4	17.6	1	.	.
080186	14:35	B3Q4	16.4	1	.	.
080286	13:55	B3Q4	13.8	1	.	.
080386	14:30	B3Q4	16	1	.	.
080486	14:20	B3Q4	15.6	1	.	.
080586	14:10	B3Q4	16.3	1	.	.
080686	14:00	B3Q4	19	2	.	.
080786	14:30	B3Q4	15	1	.	.
080886	13:20	B3Q4	14	2	.	.
080986	14:05	B3Q4	14.4	1	.	.
081086	13:15	B3Q4	11.6	1	.	.
081186	13:45	B3Q4	11.6	1	.	.
081286	14:05	B3Q4	11.9	1	.	.
081386	13:25	B3Q4	10.1	1	.	.
081486	13:05	B3Q4	7.8	0	.	.
081586	13:35	B3Q4	7.2	0	.	.
081686	13:30	B3Q4	10.0	1	.	.
081786	14:55	B3Q4	8	1	.	.
081886	13:20	B3Q4	6.0	1	.	.
081986	13:15	B3Q4	6.2	1	.	.
082086	14:30	B3Q4	4.9	1	.	.
082186	13:35	B3Q4	5.2	1	.	.
082286	13:25	B3Q4	4.3	1	.	.
082586	14:00	B3Q4	4.0	0	.	.
082686	14:45	B3Q4	3.3	0	.	.
082786	14:15	B3Q4	2.9	0	.	.
082886	13:50	B3Q4	2.5	0	.	.
082986	13:50	B3Q4	2.7	0	.	.
090186	13:35	B3Q4	2.9	0	.	.

TABLE B.1.B
CHEMICAL PARAMETERS: TRACER CONCENTRATIONS

DEPTH-550 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	IODIDE (mg/L)	SD +/-	STRONTIUM (mg/L)	SD +/-
.	14:45	OUTFLOW	3.4	0	.	.
.	15:00	OUTFLOW	6.6	0	.	.
071686	9:30	OUTFLOW	<.1	.	0.47	0
072986	13:00	OUTFLOW	18	1	.	.
073086	16:00	OUTFLOW	28	1	.	.
080186	16:00	OUTFLOW	32	2	.	.
080286	14:02	OUTFLOW	27	2	.	.
080386	14:00	OUTFLOW	25	1	.	.
080486	16:00	OUTFLOW	21	1	.	.
080586	16:00	OUTFLOW	19	1	.	.
080686	16:00	OUTFLOW	17	2	.	.
080786	13:00	OUTFLOW	14	1	.	.
080886	16:00	OUTFLOW	13	2	.	.
080986	13:05	OUTFLOW	13.3	1	.	.
081086	13:22	OUTFLOW	10.5	1	.	.
081186	15:00	OUTFLOW	10.4	1	.	.
081286	15:50	OUTFLOW	10.0	1	.	.
081386	16:00	OUTFLOW	9.2	1	.	.
081486	16:00	OUTFLOW	8.2	0	.	.
081686	13:10	OUTFLOW	6.6	1	.	.
081886	16:15	OUTFLOW	5.7	1	.	.
081986	15:00	OUTFLOW	5.4	1	.	.
082086	15:30	OUTFLOW	4.8	1	.	.
082186	13:40	OUTFLOW	4.4	1	.	.
082286	15:00	OUTFLOW	4.0	1	.	.
082586	15:00	OUTFLOW	4.0	0	.	.
082786	15:00	OUTFLOW	3.1	0	.	.
082886	16:00	OUTFLOW	3.0	0	.	.
082986	14:30	OUTFLOW	2.8	0	.	.
090186	16:15	OUTFLOW	2.6	0	.	.

TABLE B.2.A
CHEMICAL PARAMETERS: Cl, PO₄,

DEPTH-0 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	CHLORIDE (mg/L)	SD +/-	PHOSPHATE (mg/L)	SD +/-
071686	9:30	INFLOW	355	18	<.5	.

DEPTH-036 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	CHLORIDE (mg/L)	SD +/-	PHOSPHATE (mg/L)	SD +/-
071686	9:00	B8Q1	355	18	<.5	.
071786	.	B8Q1	355	18	<.5	.
072086	13:00	B8Q1	260	13	.	.
072186	15:30	B8Q1	282	14	<.5	.
072386	15:15	B8Q1	265	13	<.5	.
072586	14:50	B8Q1	312	16	<.5	.
072786	15:28	B8Q1	382	20	<.5	.
072986	14:00	B8Q1	343	20	<.5	.
080186	13:05	B8Q1	339	17	<.5	.
080486	13:25	B8Q1	353	18	<.5	.
080686	13:15	B8Q1	340	17	<.5	.
080886	14:45	B8Q1	327	16	<.5	.
081186	14:25	B8Q1	350	18	<.5	.
081386	14:20	B8Q1	329	16	<.5	.
082086	14:40	B8Q1	331	17	<.5	.
082786	14:25	B8Q1	373	19	<.5	.
090186	14:15	B8Q1	332	17	<.5	.
071686	9:00	B8Q2	355	18	<.5	.
071886	12:00	B8Q2	332	20	.	.
072086	13:00	B8Q2	253	13	.	.
072186	15:30	B8Q2	275	14	<.5	.
072386	15:15	B8Q2	377	20	<.5	.
072586	14:50	B8Q2	328	20	<.5	.
072786	15:30	B8Q2	377	20	<.5	.
072986	14:00	B8Q2	343	20	<.5	.
080186	13:15	B8Q2	336	17	<.5	.
080486	13:26	B8Q2	348	18	<.5	.
080686	13:20	B8Q2	334	17	<.5	.
080886	14:45	B8Q2	337	16	<.5	.
081186	14:20	B8Q2	348	18	<.5	.
081386	14:20	B8Q2	329	16	<.5	.
082286	14:50	B8Q2	355	18	<.5	.
082986	14:00	B8Q2	334	17	<.5	.
071686	9:05	B8Q3	349	18	<.5	.
071786	.	B8Q3	355	18	<.5	.
071886	12:00	B8Q3	343	20	.	.

TABLE B.2.A
CHEMICAL PARAMETERS: Cl, PO₄,

DEPTH-036 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	CHLORIDE (mg/L)	SD +/-	PHOSPHATE (mg/L)	SD +/-
072086	13:00	B8Q3	258	13		.
072186	15:30	B8Q3	283	14	<.5	.
072386	15:15	B8Q3	269	13	<.5	.
072586	14:50	B8Q3	300	15	<.5	.
072786	15:28	B8Q3	377	20	<.5	.
072986	14:00	B8Q3	342	20	<.5	.
080186	13:10	B8Q3	336	17	<.5	.
080486	13:27	B8Q3	353	18	<.5	.
080686	13:15	B8Q3	334	17	<.5	.
080886	14:50	B8Q3	333	16	<.5	.
081186	14:30	B8Q3	344	18	<.5	.
081386	14:20	B8Q3	326	16	<.5	.
071686	9:05	B8Q4	347	18	<.5	.
071886	12:00	B8Q4	344	20		.
072086	13:00	B8Q4	267	13		.
072186	15:30	B8Q4	277	14	<.5	.
072386	15:15	B8Q4	266	13	<.5	.
072586	14:50	B8Q4	278	14	<.5	.
072786	15:29	B8Q4	384	20	<.5	.
072986	14:00	B8Q4	338	20	<.5	.
080186	13:15	B8Q4	334	17	<.5	.
080486	13:28	B8Q4	355	18	<.5	.
080686	13:17	B8Q4	329	17	<.5	.
080886	14:50	B8Q4	324	16	<.5	.
081186	14:25	B8Q4	336	17	<.5	.
081386	14:20	B8Q4	322	16	<.5	.
081586	14:17	B8Q4	338	17	<.5	.
081886	14:27	B8Q4	325	17	<.5	.

DEPTH-113 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	CHLORIDE (mg/L)	SD +/-	PHOSPHATE (mg/L)	SD +/-
071686	9:10	B7Q1	355	18	<.5	.
071886	11:45	B7Q1	309	15		.
072086	12:30	B7Q1	278	14		.
072186	13:00	B7Q1	330	16	<.5	.
072386	14:00	B7Q1	301	15	<.5	.
072586	13:10	B7Q1	276	14	<.5	.
072786	13:56	B7Q1	267	15	<.5	.
072986	13:50	B7Q1	273	15	<.5	.
080186	13:30	B7Q1	262	13	<.5	.

TABLE B.2.A
CHEMICAL PARAMETERS: Cl, PO₄,

DEPTH-113 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	CHLORIDE (mg/L)	SD +/-	PHOSPHATE (mg/L)	SD +/-
080486	13:00	B7Q1	289	15	<.5	.
080686	13:30	B7Q1	306	15	<.5	.
080886	13:00	B7Q1	326	16	<.5	.
081186	13:00	B7Q1	331	17	<.5	.
081386	13:30	B7Q1	305	15	<.5	.
082986	13:00	B7Q1	341	18	<.5	.
071886	11:45	B7Q2	285	15		.
072086	13:00	B7Q2	265	13		.
072186	15:30	B7Q2	300	16	<.5	.
072386	13:00	B7Q2	267	13	<.5	.
072586	13:30	B7Q2	258	13	<.5	.
072786	14:21	B7Q2	305	15	<.5	.
072986	14:10	B7Q2	300	16	<.5	.
080186	13:35	B7Q2	306	15	<.5	.
080486	13:15	B7Q2	303	15	<.5	.
080686	13:50	B7Q2	326	16	<.5	.
080886	13:35	B7Q2	354	17	<.5	.
081186	13:20	B7Q2	350	18	<.5	.
081386	13:00	B7Q2	325	16	<.5	.
081886	13:00	B7Q2	339	17	<.5	.
082286	13:00	B7Q2	362	19	<.5	.
071886	11:45	B7Q3	291	15		.
072086	12:30	B7Q3	282	14		.
072186	15:30	B7Q3	294	16	<.5	.
072386	13:00	B7Q3	395	20	<.5	.
072586	13:45	B7Q3	281	14	<.5	.
072786	14:24	B7Q3	325	16	<.5	.
072986	14:10	B7Q3	300	16	<.5	.
080186	14:05	B7Q3	306	15	<.5	.
080486	14:15	B7Q3	308	15	<.5	.
080686	13:40	B7Q3	331	16	<.5	.
080886	13:35	B7Q3	337	17	<.5	.
081186	13:15	B7Q3	347	18	<.5	.
081386	13:40	B7Q3	319	16	<.5	.
081586	13:10	B7Q3	325	17	<.5	.
082086	13:45	B7Q3	353	18	<.5	.
082786	13:35	B7Q3	334	17	<.5	.
071886	11:45	B7Q4	311	15		.
072086	14:00	B7Q4	312	16		.
072186	13:15	B7Q4	326	16	<.5	.
072386	14:00	B7Q4	402	20	<.5	.
072586	13:45	B7Q4	255	13	<.5	.
072786	14:42	B7Q4	308	15	<.5	.
072986	14:15	B7Q4	302	16	<.5	.

TABLE B.2.A
CHEMICAL PARAMETERS: Cl, PO₄,

DEPTH-113 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	CHLORIDE (mg/L)	SD +/-	PHOSPHATE (mg/L)	SD +/-
080186	14:00	B7Q4	307	15	<.5	.
080486	14:22	B7Q4	336	16	<.5	.
080686	14:15	B7Q4	316	16	<.5	.
080886	13:15	B7Q4	315	16	<.5	.
081186	13:20	B7Q4	336	17	<.5	.
081386	13:10	B7Q4	317	16	<.5	.
090186	13:20	B7Q4	341	18	<.5	.

DEPTH-339 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	CHLORIDE (mg/L)	SD +/-	PHOSPHATE (mg/L)	SD +/-
071686	9:20	B5Q1	355	18	<.5	.
072586	13:55	B5Q1	363	20	<.5	.
072786	14:58	B5Q1	337	17	<.5	.
072986	14:30	B5Q1	370	20	<.5	.
080186	14:15	B5Q1	350	18	<.5	.
080486	14:45	B5Q1	329	16	<.5	.
080686	14:25	B5Q1	327	16	<.5	.
080886	14:00	B5Q1	340	17	<.5	.
081186	13:50	B5Q1	353	18	<.5	.
081386	13:50	B5Q1	320	16	<.5	.
082086	13:50	B5Q1	355	18	<.5	.
082986	13:28	B5Q1	330	17	<.5	.
072586	14:00	B5Q2	496	35	<.5	.
072786	14:59	B5Q2	421	21	<.5	.
072986	14:20	B5Q2	443	25	<.5	.
080186	14:15	B5Q2	396	20	<.5	.
080486	14:45	B5Q2	362	19	<.5	.
080686	14:30	B5Q2	346	17	<.5	.
080886	14:00	B5Q2	349	17	<.5	.
081186	13:55	B5Q2	369	18	<.5	.
081386	13:50	B5Q2	332	17	<.5	.
081586	13:37	B5Q2	332	17	<.5	.
082286	14:20	B5Q2	375	20	<.5	.
082786	13:50	B5Q2	330	17	<.5	.
072586	14:05	B5Q3	347	17	<.5	.
072786	15:04	B5Q3	320	17	<.5	.
072986	14:20	B5Q3	353	20	<.5	.
080186	14:20	B5Q3	336	17	<.5	.
080486	15:00	B5Q3	324	16	<.5	.
080686	14:30	B5Q3	306	15	<.5	.

TABLE B.2.A
CHEMICAL PARAMETERS: Cl, PO₄,

DEPTH-339 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	CHLORIDE (mg/L)	SD +/-	PHOSPHATE (mg/L)	SD +/-
080886	14:05	B5Q3	329	16	<.5	.
081186	14:00	B5Q3	344	18	<.5	.
081386	13:55	B5Q3	315	16	<.5	.
081886	13:45	B5Q3	337	17	<.5	.
071886	11:30	B5Q4	314	15	.	.
072386	13:45	B5Q4	348	17	<.5	.
072586	14:10	B5Q4	343	17	<.5	.
072786	15:08	B5Q4	366	18	<.5	.
072986	14:30	B5Q4	337	20	<.5	.
080186	14:25	B5Q4	415	21	<.5	.
080486	15:00	B5Q4	311	16	<.5	.
080686	14:35	B5Q4	383	18	<.5	.
080886	14:10	B5Q4	351	17	<.5	.
081186	14:00	B5Q4	347	18	<.5	.
081386	.	B5Q4	322	16	<.5	.
090186	14:00	B5Q4	345	18	<.5	.

DEPTH-415 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	CHLORIDE (mg/L)	SD +/-	PHOSPHATE (mg/L)	SD +/-
071686	9:25	B3Q4	355	18	<.5	.

DEPTH-550 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	CHLORIDE (mg/L)	SD +/-	PHOSPHATE (mg/L)	SD +/-
071686	9:30	OUTFLOW	355	18	<.5	.

TABLE B.2.B
CHEMICAL PARAMETERS: SO₄, ALKALINITY, SiO₂

DEPTH-0 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	SULFATE (mg/L)	SD +/-	ALKALINITY (mgCaCO ₃ /L)	SiO ₂ (mg/L)	SD +/-
071686	9:30	INFLOW	2.6	0	132	83	7.0
071786	9:30	INFLOW	.	.	133	.	.
071886	12:00	INFLOW	.	.	131	.	.
072086	15:30	INFLOW	.	.	237	.	.
072486	16:00	INFLOW	.	.	134	.	.
072586	13:00	INFLOW	.	.	129	.	.
072686	13:31	INFLOW	.	.	133	.	.
072786	13:21	INFLOW	.	.	136	.	.
072886	13:00	INFLOW	.	.	133	.	.
073086	16:00	INFLOW	.	.	136	.	.
080186	16:00	INFLOW	.	.	139	.	.
080386	14:00	INFLOW	.	.	135	.	.
080686	16:00	INFLOW	.	.	132	.	.
080886	16:00	INFLOW	.	.	128	.	.
081186	15:00	INFLOW	.	.	127	.	.
081586	16:00	INFLOW	.	.	152	.	.
081886	16:15	INFLOW	.	.	119	.	.
082286	15:00	INFLOW	.	.	140	.	.
082786	15:00	INFLOW	.	.	109	.	.

DEPTH-036 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	SULFATE (mg/L)	SD +/-	ALKALINITY (mgCaCO ₃ /L)	SiO ₂ (mg/L)	SD +/-
071686	9:00	B8Q1	2.5	0	.	79	4.0
071786	.	B8Q1	3.5	0	.	77	7.0
072086	13:00	B8Q1	3.2	0	.	.	.
072186	15:30	B8Q1	2.0	0	.	.	.
072386	15:15	B8Q1	2.3	0	.	.	.
072586	14:50	B8Q1	1.9	0	.	.	.
072786	15:28	B8Q1	1.9	0	.	91	4.0
072986	14:00	B8Q1	2.6	0	.	.	.
080186	13:05	B8Q1	3.0	0	.	.	.
080486	13:25	B8Q1	2.9	0	.	.	.
080686	13:15	B8Q1	2.8	0	.	.	.
080886	14:45	B8Q1	2.7	0	.	.	.
081186	14:25	B8Q1	2.6	0	.	.	.
081386	14:20	B8Q1	2.8	0	.	.	.
082086	14:40	B8Q1	2.7	0	.	.	.
082786	14:25	B8Q1	2.6	0	.	.	.
090186	14:15	B8Q1	2.4	0	.	.	.
071686	9:00	B8Q2	2.4	0	.	77	7.0

TABLE B.2.B
CHEMICAL PARAMETERS: SO₄,ALKALINITY,SIO₂

DEPTH-036 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	SULFATE (mg/L)	SD +/-	ALKALINITY (mgCAO ₃ /L)	SIO ₂ (mg/L)	SD +/-
071786	.	B8Q2	.	.	.	80	4.0
071886	12:00	B8Q2	3.0	0	.	.	.
072086	13:00	B8Q2	2.7	0	.	.	.
072186	15:30	B8Q2	2.0	0	.	.	.
072386	15:15	B8Q2	2.4	0	.	.	.
072586	14:50	B8Q2	1.9	0	.	.	.
072786	15:30	B8Q2	2.3	0	.	.	.
072986	14:00	B8Q2	2.6	0	.	92	5.0
080186	13:15	B8Q2	2.8	0	.	.	.
080486	13:26	B8Q2	2.8	0	.	.	.
080686	13:20	B8Q2	2.8	0	.	.	.
080886	14:45	B8Q2	2.7	0	.	.	.
081186	14:20	B8Q2	2.7	0	.	.	.
081386	14:20	B8Q2	2.8	0	.	.	.
082286	14:50	B8Q2	2.5	0	.	.	.
082986	14:00	B8Q2	2.4	0	.	.	.
071686	9:05	B8Q3	2.9	0	.	80	5.0
071786	.	B8Q3	3.0	0	.	80	7.0
071886	12:00	B8Q3	3.2	0	.	.	.
072086	13:00	B8Q3	3.0	0	.	.	.
072186	15:30	B8Q3	2.0	0	.	84	7.0
072386	15:15	B8Q3	2.4	0	.	.	.
072586	14:50	B8Q3	2.2	0	.	.	.
072786	15:28	B8Q3	2.0	0	.	.	.
072986	14:00	B8Q3	2.6	0	.	.	.
080186	13:10	B8Q3	2.9	0	.	.	.
080486	13:27	B8Q3	2.5	0	.	.	.
080686	13:15	B8Q3	2.8	0	.	.	.
080886	14:50	B8Q3	2.7	0	.	.	.
081186	14:30	B8Q3	2.6	0	.	.	.
081386	14:20	B8Q3	2.6	0	.	.	.
071686	9:05	B8Q4	2.6	0	.	81	4.0
071786	.	B8Q4	.	.	.	81	7.0
071886	12:00	B8Q4	3.2	0	.	.	.
072086	13:00	B8Q4	2.9	0	.	.	.
072186	15:30	B8Q4	2.0	0	.	.	.
072386	15:15	B8Q4	2.5	0	.	87	4.0
072586	14:50	B8Q4	2.5	0	.	87	4.0
072786	15:29	B8Q4	2.0	0	.	.	.
072986	14:00	B8Q4	2.5	0	.	.	.
080186	13:15	B8Q4	3.0	0	.	.	.
080486	13:28	B8Q4	2.9	0	.	.	.
080686	13:17	B8Q4	2.7	0	.	.	.
080886	14:50	B8Q4	2.8	0	.	.	.

TABLE B.2.B
CHEMICAL PARAMETERS: SO₄,ALKALINITY,SIO₂

DEPTH-036 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	SULFATE (mg/L)	SD +/-	ALKALINITY (mgCACO ₃ /L)	SIO ₂ (mg/L)	SD +/-
081186	14:25	B8Q4	2.7	0	.	.	.
081386	14:20	B8Q4	2.7	0	.	.	.
081586	14:17	B8Q4	2.5	0	.	.	.
081886	14:27	B8Q4	2.5	0	.	.	.

DEPTH-113 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	SULFATE (mg/L)	SD +/-	ALKALINITY (mgCACO ₃ /L)	SIO ₂ (mg/L)	SD +/-
071686	9:10	B7Q1	2.8	0	.	68	6.0
071886	11:45	B7Q1	4.5	0	.	.	.
072086	12:30	B7Q1	3.7	0	.	.	.
072186	13:00	B7Q1	2.9	0	147	.	.
072386	14:00	B7Q1	6.3	1	156	.	.
072486	13:50	B7Q1	.	.	159	.	.
072586	13:10	B7Q1	3.0	0	162	.	.
072686	15:02	B7Q1	.	.	175	.	.
072786	13:56	B7Q1	2.9	0	163	.	.
072886	13:30	B7Q1	.	.	195	.	.
072986	13:50	B7Q1	2.6	0	.	84	8.0
073086	13:35	B7Q1	.	.	158	.	.
080186	13:30	B7Q1	2.6	0	159	.	.
080386	13:30	B7Q1	.	.	162	.	.
080486	13:00	B7Q1	2.6	0	.	.	.
080686	13:30	B7Q1	2.6	0	186	.	.
080886	13:00	B7Q1	2.6	0	212	.	.
081186	13:00	B7Q1	3.6	0	204	.	.
081386	13:30	B7Q1	2.2	0	.	.	.
082986	13:00	B7Q1	2.5	0	.	.	.
071686	9:10	B7Q2	.	.	.	65	3.0
071786	.	B7Q2	.	.	146	.	.
071886	11:45	B7Q2	3.8	0	.	.	.
071986	10:30	B7Q2	.	.	145	.	.
072086	13:00	B7Q2	3.7	0	.	.	.
072186	15:30	B7Q2	2.5	0	.	.	.
072286	13:00	B7Q2	.	.	149	.	.
072386	13:00	B7Q2	5.7	1	.	82	5.0
072586	13:30	B7Q2	2.3	0	157	.	.
072786	14:21	B7Q2	2.0	0	.	86	9.0
072886	13:45	B7Q2	.	.	170	.	.
072986	14:10	B7Q2	3.3	0	.	.	.
080186	13:35	B7Q2	2.7	0	237	.	.

TABLE B.2.B
CHEMICAL PARAMETERS: SO₄,ALKALINITY,SIO₂

DEPTH-113 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	SULFATE (mg/L)	SD +/-	ALKALINITY (mgCACO ₃ /L)	SIO ₂ (mg/L)	SD +/-
080486	13:15	B7Q2	2.7	0	.	.	.
080686	13:50	B7Q2	2.7	0	.	.	.
080886	13:35	B7Q2	2.7	0	.	.	.
081186	13:20	B7Q2	3.9	0	.	.	.
081386	13:00	B7Q2	2.2	0	.	.	.
081586	13:00	B7Q2	.	.	154	.	.
081886	13:00	B7Q2	2.4	0	141	.	.
082286	13:00	B7Q2	2.6	0	133	.	.
082786	13:00	B7Q2	.	.	118	.	.
071686	9:15	B7Q3	.	.	144	71	3.0
071786	.	B7Q3	.	.	144	.	.
071886	11:45	B7Q3	3.6	0	.	.	.
071986	10:30	B7Q3	.	.	146	.	.
072086	12:30	B7Q3	3.3	0	144	.	.
072186	15:30	B7Q3	2.5	0	.	83	6.0
072386	13:00	B7Q3	2.8	0	.	.	.
072486	14:00	B7Q3	.	.	173	.	.
072586	13:45	B7Q3	2.2	0	.	.	.
072686	14:25	B7Q3	.	.	181	.	.
072786	14:24	B7Q3	2.0	0	197	.	.
072986	14:10	B7Q3	2.6	0	.	.	.
080186	14:05	B7Q3	2.7	0	.	.	.
080486	14:15	B7Q3	2.8	0	.	.	.
080686	13:40	B7Q3	2.7	0	215	.	.
080886	13:35	B7Q3	2.7	0	.	.	.
081186	13:15	B7Q3	2.4	0	173	.	.
081386	13:40	B7Q3	2.8	0	.	.	.
081586	13:10	B7Q3	2.9	0	145	.	.
081886	13:05	B7Q3	.	.	135	.	.
082086	13:45	B7Q3	2.6	0	.	.	.
082286	13:05	B7Q3	.	.	131	.	.
082786	13:35	B7Q3	2.6	0	.	.	.
071686	9:15	B7Q4	.	.	143	70	11.0
071886	11:45	B7Q4	3.9	0	.	.	.
072086	14:00	B7Q4	3.9	0	.	.	.
072186	13:15	B7Q4	3.1	0	17	.	.
072286	13:15	B7Q4	.	.	182	.	.
072386	14:00	B7Q4	3.0	0	185	.	.
072586	13:45	B7Q4	2.1	0	.	83	6.0
072736	14:42	B7Q4	2.0	0	.	.	.
072986	14:15	B7Q4	2.6	0	.	.	.
073086	13:50	B7Q4	.	.	186	.	.
080186	14:00	B7Q4	2.8	0	.	.	.
080386	13:25	B7Q4	.	.	230	.	.

TABLE B.2.B
CHEMICAL PARAMETERS: SO₄,ALKALINITY,SIO₂

DEPTH-113 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	SULFATE (mg/L)	SD +/-	ALKALINITY (mgCACO ₃ /L)	SIO ₂ (mg/L)	SD +/-
080486	14:22	B7Q4	2.6	0	.	.	.
080686	14:15	B7Q4	2.6	0	.	.	.
080886	13:15	B7Q4	2.7	0	218	.	.
081186	13:20	B7Q4	2.7	0	.	.	.
081386	13:10	B7Q4	2.4	0	.	.	.
082786	13:15	B7Q4	.	.	109	.	.
090186	13:20	B7Q4	2.5	0	.	.	.

DEPTH-339 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	SULFATE (mg/L)	SD +/-	ALKALINITY (mgCACO ₃ /L)	SIO ₂ (mg/L)	SD +/-
071686	9:20	B5Q1	3.0	0	.	58	7.0
072586	13:55	B5Q1	2.1	0	.	66	6.0
072786	14:58	B5Q1	2.6	0	.	.	.
072986	14:30	B5Q1	2.8	0	.	.	.
080186	14:15	B5Q1	3.0	0	.	.	.
080486	14:45	B5Q1	2.9	0	.	.	.
080686	14:25	B5Q1	2.9	0	.	.	.
080886	14:00	B5Q1	3.0	0	.	.	.
081186	13:50	B5Q1	3.5	0	.	.	.
081386	13:50	B5Q1	1.9	0	.	.	.
081586	13:30	B5Q1	2.8	0	.	.	.
082086	13:50	B5Q1	2.8	0	.	.	.
082986	13:28	B5Q1	2.8	0	.	.	.
071686	9:20	B5Q2	.	.	.	61	4.0
072586	14:00	B5Q2	3.1	0	.	.	.
072786	14:59	B5Q2	2.7	0	.	.	.
072986	14:20	B5Q2	2.7	0	.	69	5.0
080186	14:15	B5Q2	3.0	0	.	.	.
080486	14:45	B5Q2	3.1	0	.	.	.
080686	14:30	B5Q2	3.1	0	.	.	.
080886	14:00	B5Q2	3.1	0	.	.	.
081186	13:55	B5Q2	3.6	0	.	.	.
081386	13:50	B5Q2	2.3	0	.	.	.
082286	14:20	B5Q2	2.9	0	.	.	.
082786	13:50	B5Q2	3.2	0	.	.	.
071686	9:20	B5Q3	.	.	.	62	4.0
072586	14:05	B5Q3	3.5	0	.	.	.
072786	15:04	B5Q3	3.1	0	.	.	.
072986	14:20	B5Q3	3.2	0	.	.	.
080186	14:20	B5Q3	3.2	0	.	.	.

TABLE B.2.B
CHEMICAL PARAMETERS: SO₄,ALKALINITY,SIO₂

DEPTH-339 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	SULFATE (mg/L)	SD +/-	ALKALINITY (mgCACO ₃ /L)	SIO ₂ (mg/L)	SD +/-
080486	15:00	B5Q3	3.2	0	.	.	.
080686	14:30	B5Q3	3.1	0	.	.	.
080886	14:05	B5Q3	3.1	0	.	.	.
081186	14:00	B5Q3	4.2	0	.	.	.
081386	13:55	B5Q3	2.7	0	.	.	.
081886	13:45	B5Q3	2.9	0	.	.	.
071686	9:20	B5Q4	.	.	.	64	4.0
071886	11:30	B5Q4	4.0	0	.	.	.
072386	13:45	B5Q4	2.4	0	.	72	5.0
072586	14:10	B5Q4	2.3	0	.	.	.
072786	15:08	B5Q4	2.3	0	.	79	5.0
072986	14:30	B5Q4	2.8	0	.	.	.
080186	14:25	B5Q4	3.0	0	.	.	.
080486	15:00	B5Q4	2.9	0	.	.	.
080686	14:35	B5Q4	3.2	0	.	.	.
080886	14:10	B5Q4	2.9	0	.	.	.
081186	14:00	B5Q4	3.6	0	.	.	.
081386	.	B5Q4	2.9	0	.	.	.
090186	14:00	B5Q4	2.7	0	.	.	.

DEPTH-415 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	SULFATE (mg/L)	SD +/-	ALKALINITY (mgCACO ₃ /L)	SIO ₂ (mg/L)	SD +/-
071686	9:25	B3Q1	.	.	134	61	4.0
071886	11:15	B3Q1	.	.	138	.	.
071986	10:45	B3Q1	.	.	138	.	.
072186	14:00	B3Q1	.	.	138	.	.
072386	14:20	B3Q1	.	.	137	.	.
073086	14:20	B3Q1	.	.	166	.	.
080686	13:50	B3Q1	.	.	162	.	.
080886	14:00	B3Q1	.	.	166	.	.
071686	9:25	B3Q2	.	.	125	59	4.0
071786	.	B3Q2	.	.	123	.	.
071886	11:15	B3Q2	.	.	113	.	.
071986	.	B3Q2	.	.	131	.	.
072086	12:45	B3Q2	.	.	120	.	.
080186	14:30	B3Q2	.	.	116	.	.
080386	14:15	B3Q2	.	.	116	.	.
081186	14:00	B3Q2	.	.	117	.	.
081586	13:45	B3Q2	.	.	120	.	.
081886	13:10	B3Q2	.	.	108	.	.

TABLE B.2.B
CHEMICAL PARAMETERS: SO₄,ALKALINITY,SIO₂

DEPTH-415 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	SULFATE (mg/L)	SD +/-	ALKALINITY (mgCACO ₃ /L)	SIO ₂ (mg/L)	SD +/-
082786	14:00	B3Q2	.	.	107	.	.
071686	9:25	B3Q3	.	.	.	56	7.0
071786	.	B3Q3	.	.	129	.	.
071886	11:15	B3Q3	.	.	127	.	.
072186	14:00	B3Q3	.	.	136	.	.
072386	14:20	B3Q3	.	.	135	.	.
080886	14:15	B3Q3	.	.	134	.	.
081186	14:15	B3Q3	.	.	125	.	.
082286	13:15	B3Q3	.	.	114	.	.
071686	9:25	B3Q4	3.3	0	.	62	4.0
071786	.	B3Q4	.	.	140	.	.
071886	11:15	B3Q4	.	.	140	.	.
072086	12:45	B3Q4	.	.	142	.	.
073086	14:45	B3Q4	.	.	180	.	.
080186	14:35	B3Q4	.	.	177	.	.
080386	14:30	B3Q4	.	.	183	.	.
080686	14:00	B3Q4	.	.	178	.	.
081586	13:35	B3Q4	.	.	155	.	.
081886	13:20	B3Q4	.	.	146	.	.
082286	13:25	B3Q4	.	.	144	.	.
082786	14:15	B3Q4	.	.	124	.	.

DEPTH-550 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	SULFATE (mg/L)	SD +/-	ALKALINITY (mgCACO ₃ /L)	SIO ₂ (mg/L)	SD +/-
071686	9:30	OUTFLOW	3.4	0	132	72	4.0
071786	15:00	OUTFLOW	.	.	131	.	.
071886	10:00	OUTFLOW	.	.	134	.	.
071986	9:00	OUTFLOW	.	.	133	.	.
072086	13:00	OUTFLOW	.	.	132	.	.
072186	.	OUTFLOW	.	.	133	.	.
072386	16:00	OUTFLOW	.	.	134	.	.
072886	13:00	OUTFLOW	.	.	150	.	.
073086	16:00	OUTFLOW	.	.	177	.	.
080186	16:00	OUTFLOW	.	.	186	.	.
080386	14:00	OUTFLOW	.	.	184	.	.
080686	16:00	OUTFLOW	.	.	167	.	.
080886	16:00	OUTFLOW	.	.	171	.	.
081186	15:00	OUTFLOW	.	.	161	.	.
081586	16:00	OUTFLOW	.	.	129	.	.
081886	16:15	OUTFLOW	.	.	164	.	.

TABLE B.2.B
CHEMICAL PARAMETERS: SO₄,ALKALINITY,SiO₂

DEPTH=550 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	SULFATE (mg/L)	SD +/-	ALKALINITY (mgCACO ₃ /L)	SiO ₂ (mg/L)	SD +/-
082286	15:00	OUTFLOW	.	.	152	.	.
082786	15:00	OUTFLOW	.	.	131	.	.

TABLE B.3.A
CHEMICAL PARAMETERS: CALCIUM, MAGNESIUM

DEPTH=0 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	CALCIUM (mg/L)	SD +/-	MAGNESIUM (mg/L)	SD +/-
071686	9:30	INFLOW	191	5	3.5	0
071986	15:00	INFLOW	160	8	3.5	0
072086	15:30	INFLOW	150	8	3.7	0
072186	15:30	INFLOW	148	6	3.8	0
072286	16:00	INFLOW	156	6	3.8	0
072386	16:00	INFLOW	154	8	3.8	0

DEPTH=036 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	CALCIUM (mg/L)	SD +/-	MAGNESIUM (mg/L)	SD +/-
071686	9:00	B8Q1	178	6	4.4	0
071786	.	B8Q1	191	4	4.2	0
071886	12:00	B8Q1	185	9	4.3	0
071986	14:45	B8Q1	202	6	3.9	0
072086	13:00	B8Q1	186	7	4.2	0
072186	15:30	B8Q1	189	8	4.2	0
072286	13:00	B8Q1	187	8	4.2	0
072386	15:15	B8Q1	178	10	4.1	0
072586	14:50	B8Q1	175	8	3.9	0
072886	13:00	B8Q1	200	20	3.8	0
073086	15:00	B8Q1	178	7	3.8	0
080186	13:05	B8Q1	198	9	3.9	0
080486	13:25	B8Q1	196	7	3.9	0
080686	13:15	B8Q1	190	10	3.7	0
080886	14:45	B8Q1	186	8	3.7	0
081186	14:25	B8Q1	200	10	3.9	0
081386	14:20	B8Q1	200	10	3.8	0
081586	14:15	B8Q1	193	5	3.8	0
081886	14:20	B8Q1	185	6	3.6	0
082086	14:40	B8Q1	189	5	3.5	0
082286	14:50	B8Q1	191	6	3.7	0
082586	14:20	B8Q1	237	10	4.1	0
082786	14:25	B8Q1	208	8	3.9	0
082986	14:00	B8Q1	201	8	3.7	0
090186	14:15	B8Q1	190	20	3.7	0
071686	9:00	B8Q2	177	10	5.0	0
071786	.	B8Q2	200	20	4.9	0
071886	12:00	B8Q2	189	7	4.5	0
071986	14:45	B8Q2	196	7	4.0	0
072086	13:00	B8Q2	187	8	4.2	0
072186	15:30	B8Q2	178	6	4.0	0

TABLE B.3.A
CHEMICAL PARAMETERS: CALCIUM, MAGNESIUM

DEPTH-036 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	CALCIUM (mg/L)	SD +/-	MAGNESIUM (mg/L)	SD +/-
072286	13:00	B8Q2	177	8	4.0	0
072386	15:15	B8Q2	166	8	3.8	0
072586	14:50	B8Q2	183	7	3.9	0
072886	13:00	B8Q2	200	8	3.7	0
073086	15:05	B8Q2	190	10	3.6	0
080186	13:15	B8Q2	195	6	3.7	0
080486	13:26	B8Q2	195	9	3.8	0
080686	13:20	B8Q2	186	7	3.6	0
080886	14:45	B8Q2	189	7	3.7	0
081186	14:20	B8Q2	202	10	3.6	0
081386	14:20	B8Q2	192	5	3.7	0
081586	14:17	B8Q2	194	5	3.7	0
081886	14:20	B8Q2	178	8	3.6	0
082086	14:40	B8Q2	182	7	3.5	0
082286	14:50	B8Q2	195	6	3.8	0
082586	14:30	B8Q2	262	12	3.9	0
082786	14:25	B8Q2	196	7	3.7	0
082986	14:00	B8Q2	191	7	3.5	0
090186	14:15	B8Q2	202	10	3.9	0
071686	9:05	B8Q3	137	6	3.4	0
071786		B8Q3	174	4	4.5	0
071886	12:00	B8Q3	178	6	4.9	0
071986	14:45	B8Q3	206	8	4.2	0
072086	13:00	B8Q3	204	10	4.2	0
072186	15:30	B8Q3	201	10	4.2	0
072286	13:00	B8Q3	187	6	4.1	0
072386	15:15	B8Q3	182	10	4.2	0
072586	14:50	B8Q3	164	7	3.9	0
072886	13:00	B8Q3	200	10	3.6	0
073086	15:15	B8Q3	180	10	3.6	0
080186	13:10	B8Q3	200	20	3.8	0
080486	13:27	B8Q3	190	10	3.8	0
080686	13:15	B8Q3	190	6	3.6	0
080886	14:50	B8Q3	185	7	3.7	0
081186	14:30	B8Q3	210	10	3.9	0
081386	14:20	B8Q3	205	5	3.8	0
081586	14:17	B8Q3	202	6	3.7	0
081886	14:10	B8Q3	179	8	3.5	0
082086	14:45	B8Q3	184	5	3.6	0
082286	14:50	B8Q3	209	9	3.8	0
082586	14:20	B8Q3	238	10	4.1	0
082786	14:22	B8Q3	201	8	3.7	0
082986	14:00	B8Q3	189	6	3.6	0
090186	14:15	B8Q3	181	9	3.6	0

TABLE B.3.A
CHEMICAL PARAMETERS: CALCIUM, MAGNESIUM

DEPTH-036 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	CALCIUM (mg/L)	SD +/-	MAGNESIUM (mg/L)	SD +/-
071686	9:05	B8Q4	130	6	2.9	0
071786	.	B8Q4	168	8	4.0	0
071886	12:00	B8Q4	184	9	4.7	0
071986	14:45	B8Q4	199	8	4.3	0
072086	13:00	B8Q4	201	10	4.3	0
072186	15:30	B8Q4	200	10	4.2	0
072286	13:00	B8Q4	190	10	4.2	0
072386	15:15	B8Q4	180	10	4.0	0
072586	14:50	B8Q4	171	7	4.0	0
072886	13:00	B8Q4	192	7	3.7	0
073086	15:20	B8Q4	166	7	3.6	0
080186	13:15	B8Q4	190	10	3.8	0
080486	13:28	B8Q4	195	8	3.8	0
080686	13:17	B8Q4	188	7	3.7	0
080886	14:50	B8Q4	190	8	3.6	0
081186	14:25	B8Q4	200	20	3.8	0
081386	14:20	B8Q4	192	6	3.8	0
081586	14:17	B8Q4	201	6	3.8	0
081886	14:27	B8Q4	200	10	3.3	0
082086	14:45	B8Q4	186	5	3.5	0
082286	14:50	B8Q4	192	6	3.6	0
082586	14:25	B8Q4	212	10	4.0	0
082786	14:25	B8Q4	217	9	4.1	0
082986	14:00	B8Q4	195	8	3.5	0
090186	14:15	B8Q4	183	6	3.5	0

DEPTH-113 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	CALCIUM (mg/L)	SD +/-	MAGNESIUM (mg/L)	SD +/-
071686	9:10	B7Q1	189	6	2.7	0
071886	11:45	B7Q1	183	9	2.5	0
071986	10:30	B7Q1	190	7	2.6	0
072086	12:30	B7Q1	180	10	2.6	0
072186	13:00	B7Q1	187	6	2.6	0
072286	13:15	B7Q1	189	8	2.6	0
072386	14:00	B7Q1	172	8	2.4	0
072586	13:10	B7Q1	170	10	2.3	0
072886	13:30	B7Q1	160	10	2.2	0
080186	13:30	B7Q1	159	7	2.5	0
080486	13:00	B7Q1	180	20	2.6	0
080686	13:30	B7Q1	189	7	2.6	0

TABLE B.3.A
CHEMICAL PARAMETERS: CALCIUM, MAGNESIUM

DEPTH=113 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	CALCIUM (mg/L)	SD +/-	MAGNESIUM (mg/L)	SD +/-
080886	13:00	B7Q1	210	10	3.2	0
081186	13:00	B7Q1	210	20	3.6	0
081386	13:30	B7Q1	206	5	3.4	0
081586	13:00	B7Q1	201	6	3.6	0
081886	13:00	B7Q1	230	20	4.0	0
082086	14:00	B7Q1	179	6	3.4	0
082286	13:00	B7Q1	201	8	3.6	0
082586	13:15	B7Q1	206	10	3.5	0
082786	13:35	B7Q1	183	6	3.7	0
082986	13:00	B7Q1	200	10	3.8	0
090186	13:03	B7Q1	180	10	3.8	0
071686	9:10	B7Q2	204	9	2.9	0
071886	11:45	B7Q2	178	6	2.5	0
071986	10:30	B7Q2	178	7	2.4	0
072086	13:00	B7Q2	170	10	2.2	1
072186	15:30	B7Q2	171	6	2.4	0
072286	13:00	B7Q2	174	9	2.2	0
072386	13:00	B7Q2	158	7	2.1	0
072586	13:30	B7Q2	170	20	2.2	0
072886	13:45	B7Q2	170	7	2.4	0
080186	13:35	B7Q2	200	20	3.3	0
080486	13:15	B7Q2	206	7	3.7	0
080686	13:50	B7Q2	196	6	3.6	0
080886	13:35	B7Q2	199	7	3.7	0
081186	13:20	B7Q2	203	8	3.9	0
081386	13:00	B7Q2	198	6	4.0	0
081586	13:00	B7Q2	193	6	4.2	0
081886	13:00	B7Q2	195	6	4.1	0
082086	13:45	B7Q2	188	8	4.0	0
082286	13:00	B7Q2	202	8	4.1	0
082586	13:20	B7Q2	204	10	4.1	0
082786	13:00	B7Q2	188	6	4.2	0
082986	13:00	B7Q2	207	9	4.2	0
090186	13:05	B7Q2	176	10	4.0	0
071686	9:15	B7Q3	197	9	2.5	0
071886	11:45	B7Q3	177	5	2.5	0
071986	10:30	B7Q3	177	8	2.3	0
072086	12:30	B7Q3	158	6	2.0	0
072186	15:30	B7Q3	175	8	2.3	0
072286	13:30	B7Q3	187	9	2.6	0
072386	13:00	B7Q3	170	8	2.4	0
072586	13:45	B7Q3	180	20	2.5	0
072886	14:10	B7Q3	188	6	2.8	0
080186	14:05	B7Q3	196	5	3.6	0

TABLE B.3.A
CHEMICAL PARAMETERS: CALCIUM, MAGNESIUM

DEPTH-113 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	CALCIUM (mg/L)	SD +/-	MAGNESIUM (mg/L)	SD +/-
080486	14:15	B7Q3	210	20	3.9	0
080686	13:40	B7Q3	204	9	3.6	0
080886	13:35	B7Q3	205	10	3.9	0
081186	13:15	B7Q3	210	10	4.1	0
081386	13:40	B7Q3	201	6	4.0	0
081586	13:10	B7Q3	190	6	4.0	0
081886	13:05	B7Q3	189	6	3.8	0
082086	13:45	B7Q3	191	9	4.0	0
082286	13:05	B7Q3	208	8	3.9	0
082586	13:35	B7Q3	192	6	4.1	0
082786	13:35	B7Q3	189	6	4.0	0
032986	13:20	B7Q3	212	9	4.1	0
090186	13:20	B7Q3	177	10	3.9	0
071686	9:15	B7Q4	206	8	2.6	0
071886	11:45	B7Q4	183	6	2.4	0
071986	10:30	B7Q4	190	10	2.5	0
072086	14:00	B7Q4	180	10	2.6	0
072186	13:15	B7Q4	193	7	2.6	0
072286	13:15	B7Q4	210	20	2.8	0
072386	14:00	B7Q4	168	8	2.5	0
072586	13:45	B7Q4	160	8	2.4	0
072886	14:15	B7Q4	179	7	2.6	0
080186	14:00	B7Q4	198	7	3.6	0
080486	14:22	B7Q4	207	7	3.8	0
080686	14:15	B7Q4	213	9	3.9	0
080886	13:15	B7Q4	199	8	4.0	0
081186	13:20	B7Q4	210	10	4.2	0
081386	13:10	B7Q4	196	5	4.2	0
081586	13:20	B7Q4	198	8	4.1	0
082086	14:10	B7Q4	187	6	4.1	0
082286	13:45	B7Q4	209	8	4.1	0
082586	13:35	B7Q4	191	9	4.3	0
082786	13:15	B7Q4	189	6	3.9	0
082986	13:15	B7Q4	220	10	4.3	0
090186	13:20	B7Q4	180	10	4.1	0

TABLE B.3.A
CHEMICAL PARAMETERS: CALCIUM, MAGNESIUM

DEPTH=339 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	CALCIUM (mg/L)	SD +/-	MAGNESIUM (mg/L)	SD +/-
071686	9:20	B5Q1	205	7	3.8	0
071686	9:20	B5Q2	226	8	4.0	0
071686	9:20	B5Q3	210	9	3.8	0
071686	9:20	B5Q4	204	10	3.8	0
071886	11:30	B5Q4	195	8	3.1	0

DEPTH=415 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	CALCIUM (mg/L)	SD +/-	MAGNESIUM (mg/L)	SD +/-
071686	9:25	B3Q1	200	7	4.3	0
071686	9:25	B3Q2	209	10	3.8	0
071686	9:25	B3Q3	204	10	3.8	0
071686	9:25	B3Q4	210	10	4.3	0

DEPTH=550 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	CALCIUM (mg/L)	SD +/-	MAGNESIUM (mg/L)	SD +/-
071686	9:30	OUTFLOW	200	20	5.7	0

TABLE B.3.B
CHEMICAL PARAMETERS: POTASSIUM, SODIUM, CESIUM

DEPTH=0 cm							
SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	POTASSIUM (mg/L)	SD +/-	SODIUM (mg/L)	SD +/-	CESIUM (mg/L)
071686	9:30	INFLOW	2.2	0	12.4	1	<.2

DEPTH=036 cm							
SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	POTASSIUM (mg/L)	SD +/-	SODIUM (mg/L)	SD +/-	CESIUM (mg/L)
071686	9:00	B8Q1	2.5	0	12.8	0	<.2
071786	.	B8Q1	2.3	0	12.6	0	<.2
072786	15:28	B8Q1	2.8	0	12.0	0	39
080886	14:45	B8Q1	2.0	0	11.7	1	4.1
081386	14:20	B8Q1	1.9	0	11.5	1	2.3
071686	9:00	B8Q2	2.6	0	13.1	1	<.2
071786	.	B8Q2	2.5	0	12.8	0	<.2
072986	14:00	B8Q2	2.1	0	12.2	0	22
080186	13:15	B8Q2	2.0	0	11.9	0	7.6
081186	14:20	B8Q2	2.0	0	11.6	1	1.2
082786	14:25	B8Q2	1.9	0	11.6	1	.4
090186	14:15	B8Q2	1.9	0	11.7	1	<.2
071686	9:05	B8Q3	2.8	0	13.3	0	<.2
071786	.	B8Q3	2.9	0	14.3	1	<.2
072186	15:30	B8Q3	4.4	0	12.7	1	6.3
080486	13:27	B8Q3	1.8	0	11.8	0	9.2
082086	14:45	B8Q3	1.9	0	11.6	1	.6
082286	14:50	B8Q3	2.0	0	11.7	1	.9
071686	9:05	B8Q4	2.9	0	12.9	1	<.2
071786	.	B8Q4	3.2	0	13.6	0	<.2
072386	15:15	B8Q4	5.0	0	12.4	0	28
072586	14:50	B8Q4	5.2	0	12.3	1	45
080686	13:17	B8Q4	1.6	0	11.8	0	15.8
081586	14:17	B8Q4	1.9	0	11.6	1	6.2
081886	14:27	B8Q4	1.9	0	11.5	1	4.6
082986	14:00	B8Q4	1.9	0	11.6	1	.9

TABLE B.3.B
CHEMICAL PARAMETERS: POTASSIUM, SODIUM, CESIUM

DEPTH=113 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	POTASSIUM (mg/L)	SD +/-	SODIUM (mg/L)	SD +/-	CESIUM (mg/L)
071686	9:10	B7Q1	2.7	0	13.6	0	<.2
072986	13:50	B7Q1	2.6	0	12.3	0	5.6
082286	13:00	B7Q1	2.6	0	11.8	1	1.6
071686	9:10	B7Q2	2.9	0	13.8	1	<.2
072386	13:00	B7Q2	2.7	0	12.5	1	.2
072786	14:21	B7Q2	2.8	0	12.7	1	4.7
080186	13:35	B7Q2	3.1	0	13.2	1	7.1
081186	13:20	B7Q2	2.5	1	12.1	1	2.5
081386	13:00	B7Q2	2.6	0	12.0	1	2.2
081886	13:00	B7Q2	2.7	0	12.0	1	1.6
090186	13:05	B7Q2	3.0	0	11.8	1	.8
071686	9:15	B7Q3	2.9	0	14.1	0	<.2
072186	15:30	B7Q3	2.7	0	13.0	1	.2
080686	13:40	B7Q3	2.7	0	12.5	1	2.7
081586	13:10	B7Q3	3.0	0	11.7	1	.4
082786	13:35	B7Q3	3.5	1	11.8	1	.7
082986	13:20	B7Q3	3.2	0	11.5	1	.8
071686	9:15	B7Q4	2.8	0	13.7	1	<.2
072586	13:45	B7Q4	3.2	0	12.9	1	9.5
080486	14:22	B7Q4	2.7	0	12.7	0	4.3
080886	13:15	B7Q4	2.6	0	12.4	1	2.2
082086	14:10	B7Q4	2.6	0	12.1	1	1.4

DEPTH=339 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	POTASSIUM (mg/L)	SD +/-	SODIUM (mg/L)	SD +/-	CESIUM (mg/L)
071686	9:20	B5Q1	4.6	0	14.2	1	<.2
072586	13:55	B5Q1	3.3	1	11.0	0	2.0
080486	14:45	B5Q1	2.5	0	10.1	0	2.3
080886	14:00	B5Q1	2.4	0	10.1	1	2.3
081586	13:30	B5Q1	2.4	0	10.9	1	2.2
081886	13:35	B5Q1	2.2	0	11.2	1	2.2
082286	14:30	B5Q1	2.4	0	11.3	1	2.3
082986	13:28	B5Q1	2.5	0	11.7	1	2.2
071686	9:20	B5Q2	5.1	0	14.9	0	<.2
072986	14:20	B5Q2	4.8	0	13.5	1	<.2
080686	14:30	B5Q2	3.1	0	11.1	1	<.2
081186	13:55	B5Q2	3.1	1	10.8	0	<.2
082786	13:50	B5Q2	3.0	0	10.4	1	<.2
071686	9:20	B5Q3	4.8	0	13.8	1	<.2
082086	13:55	B5Q3	2.9	0	12.0	1	.8

TABLE B.3.B
CHEMICAL PARAMETERS: POTASSIUM, SODIUM, CESIUM

DEPTH-339 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	POTASSIUM (mg/L)	SD +/-	SODIUM (mg/L)	SD +/-	CESIUM (mg/L)
071686	9:20	B5Q4	4.2	0	14.1	0	<.2
072386	13:45	B5Q4	3.3	0	12.7	1	.4
072786	15:08	B5Q4	3.3	0	12.3	1	.5
080186	14:25	B5Q4	3.5	0	12.3	1	3.3
081386	.	B5Q4	2.8	0	12.0	1	4.3
090186	14:00	B5Q4	2.6	0	11.7	1	1.6

DEPTH-415 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	POTASSIUM (mg/L)	SD +/-	SODIUM (mg/L)	SD +/-	CESIUM (mg/L)
071686	9:25	B3Q1	6.6	0	14.6	0	<.2
071686	9:25	B3Q2	7.9	0	15.0	0	<.2
071686	9:25	B3Q3	7.5	0	15.2	1	<.2
071686	9:25	B3Q4	6.7	0	14.9	1	<.2

DEPTH-550 cm

SAMPLING DATE	SAMPLING HOUR	SAMPLE IDENTIFICATION	POTASSIUM (mg/L)	SD +/-	SODIUM (mg/L)	SD +/-	CESIUM (mg/L)
071686	9:30	OUTFLOW	4.2	0	13.2	1	<.2

Appendix C

Moisture Profiles

**Percent Moisture at 0, 60, and 120 cm From the Center
of the Caisson to the Access Port at Various Depths**

TABLE C.1

Volumetric Moisture Content at the 36-cm Depth

DEPTH-36 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
03JUN86	0	14.1
03JUN86	60	13.5
03JUN86	120	12.9
04JUN86	0	14.8
04JUN86	60	14.0
04JUN86	120	13.3
12JUN86	0	14.6
12JUN86	60	14.0
12JUN86	120	13.1
19JUN86	0	14.8
19JUN86	60	13.9
19JUN86	120	13.5
01JUL86	0	31.8
01JUL86	60	30.0
01JUL86	120	30.1
07JUL86	0	31.8
07JUL86	60	29.6
07JUL86	120	29.1
23JUL86	0	31.8
23JUL86	60	30.2
23JUL86	120	30.6
29JUL86	0	32.6
29JUL86	10	30.8
29JUL86	20	30.9
29JUL86	30	30.7
29JUL86	40	30.8
29JUL86	50	30.6
29JUL86	60	31.0
29JUL86	70	30.8
29JUL86	80	30.8
29JUL86	90	30.3
29JUL86	100	30.8
29JUL86	110	31.1
29JUL86	120	31.8
31JUL86	0	32.2
31JUL86	10	30.9
31JUL86	20	30.5
31JUL86	30	30.7
31JUL86	40	30.5
31JUL86	50	30.6
31JUL86	60	30.3
31JUL86	70	31.1
31JUL86	80	30.9
31JUL86	90	30.6
31JUL86	100	30.6

DEPTH-36 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
31JUL86	110	30.8
31JUL86	120	31.3
05AUG86	0	32.6
05AUG86	0	32.6
05AUG86	10	31.0
05AUG86	20	31.2
05AUG86	30	30.7
05AUG86	40	30.8
05AUG86	50	30.5
05AUG86	60	30.6
05AUG86	60	31.0
05AUG86	70	30.7
05AUG86	80	30.6
05AUG86	90	30.7
05AUG86	100	30.8
05AUG86	110	31.1
05AUG86	120	31.3
05AUG86	120	31.2
05AUG86	180	30.7
05AUG86	240	30.8
05AUG86	300	30.5
05AUG86	360	30.6
05AUG86	420	30.7
05AUG86	480	30.6
05AUG86	540	30.7
05AUG86	600	30.8
05AUG86	660	31.1
05AUG86	720	31.3
12AUG86	0	33.1
12AUG86	0	33.1
12AUG86	60	30.5
12AUG86	60	30.5
12AUG86	120	31.7
12AUG86	120	31.7
20AUG86	0	32.7
20AUG86	0	32.7
20AUG86	60	30.7
20AUG86	60	30.7
20AUG86	120	32.1
20AUG86	120	32.1
28AUG86	0	32.6
28AUG86	0	32.6
28AUG86	0	32.6
28AUG86	60	31.2
28AUG86	60	31.2

DEPTH=36 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
28AUG86	60	31.2
28AUG86	120	31.4
28AUG86	120	31.4
28AUG86	120	31.4
03SEP86	0	31.7
03SEP86	60	29.1
04SEP86	0	31.9
04SEP86	60	29.7
04SEP86	120	30.8
05SEP86	0	31.6
05SEP86	60	29.9
05SEP86	120	30.9
06SEP86	0	31.6
06SEP86	60	29.8
06SEP86	120	30.7
08SEP86	0	31.5
08SEP86	60	29.7
08SEP86	120	31.0
09SEP86	0	30.3
09SEP86	60	27.9
09SEP86	120	29.4
10SEP86	0	29.8
10SEP86	0	29.8
10SEP86	60	28.1
10SEP86	60	27.6
10SEP86	120	28.5
10SEP86	120	28.6
11SEP86	0	26.9
11SEP86	0	25.9
11SEP86	60	25.1
11SEP86	60	24.5
11SEP86	120	23.7
11SEP86	120	22.7
12SEP86	0	24.7
12SEP86	0	24.4
12SEP86	60	23.2
12SEP86	60	23.2
12SEP86	120	21.6
12SEP86	120	21.9
13SEP86	0	23.5
13SEP86	0	23.1
13SEP86	60	21.9
13SEP86	60	21.7
13SEP86	120	20.5
13SEP86	120	21.9

DEPTH-36 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
14SEP86	0	22.1
14SEP86	60	20.9
14SEP86	120	19.2
15SEP86	0	21.6
15SEP86	0	21.5
15SEP86	60	20.6
15SEP86	60	20.7
15SEP86	120	19.3
15SEP86	120	19.5
16SEP86	0	21.4
16SEP86	0	21.2
16SEP86	60	19.9
16SEP86	60	20.6
16SEP86	120	18.8
16SEP86	120	19.3

TABLE C.2

Volumetric Moisture Content at the 113-cm Depth

DEPTH-113 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
03JUN86	0	16.6
03JUN86	60	16.1
03JUN86	120	13.4
04JUN86	0	18.0
04JUN86	60	16.7
04JUN86	120	13.8
12JUN86	0	17.6
12JUN86	60	16.8
12JUN86	120	14.6
19JUN86	0	17.8
19JUN86	60	16.8
19JUN86	120	14.5
01JUL86	0	31.2
01JUL86	60	30.4
01JUL86	120	32.0
07JUL86	0	30.6
07JUL86	60	29.0
07JUL86	120	31.5
23JUL86	0	31.6
23JUL86	60	29.9
23JUL86	120	32.5
29JUL86	0	31.8
29JUL86	10	30.3
29JUL86	20	30.0
29JUL86	30	29.6
29JUL86	40	29.9
29JUL86	50	29.7
29JUL86	60	29.9
29JUL86	70	30.4
29JUL86	80	31.1
29JUL86	90	31.8
29JUL86	100	31.4
29JUL86	110	32.3
29JUL86	120	32.9
31JUL86	0	31.5
31JUL86	10	30.1
31JUL86	20	30.1
31JUL86	30	29.7
31JUL86	40	29.9
31JUL86	50	29.6
31JUL86	60	29.8
31JUL86	70	30.3
31JUL86	80	31.4
31JUL86	90	31.6
31JUL86	100	31.8

DEPTH-113 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
31JUL86	110	31.9
31JUL86	120	32.8
05AUG86	0	31.4
05AUG86	0	31.4
05AUG86	10	29.7
05AUG86	20	29.8
05AUG86	30	30.0
05AUG86	40	29.6
05AUG86	50	29.7
05AUG86	60	30.4
05AUG86	60	29.7
05AUG86	70	30.5
05AUG86	80	31.3
05AUG86	90	32.3
05AUG86	100	31.8
05AUG86	110	32.9
05AUG86	120	33.1
05AUG86	120	29.8
05AUG86	180	30.0
05AUG86	240	29.6
05AUG86	300	29.7
05AUG86	360	30.4
05AUG86	420	30.5
05AUG86	480	31.3
05AUG86	540	32.3
05AUG86	600	31.8
05AUG86	660	32.9
05AUG86	720	33.1
12AUG86	0	31.4
12AUG86	0	31.4
12AUG86	60	29.9
12AUG86	60	29.9
12AUG86	120	32.9
12AUG86	120	32.9
20AUG86	0	31.4
20AUG86	0	31.4
20AUG86	60	29.8
20AUG86	60	29.8
20AUG86	120	33.3
20AUG86	120	33.3
28AUG86	0	31.7
28AUG86	0	31.7
28AUG86	0	31.7
28AUG86	60	30.3
28AUG86	60	30.3

DEPTH-113 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
28AUG86	60	30.3
28AUG86	120	33.2
28AUG86	120	33.2
28AUG86	120	33.2
03SEP86	0	30.6
03SEP86	60	29.2
03SEP86	120	27.9
04SEP86	0	30.8
04SEP86	60	29.2
04SEP86	120	32.3
05SEP86	0	30.4
05SEP86	60	29.3
05SEP86	120	32.1
06SEP86	0	30.5
06SEP86	60	29.8
06SEP86	120	31.7
08SEP86	0	30.3
08SEP86	60	29.2
08SEP86	120	32.6
09SEP86	0	29.1
09SEP86	60	27.4
09SEP86	120	30.8
10SEP86	0	28.4
10SEP86	0	28.6
10SEP86	60	27.0
10SEP86	60	27.2
10SEP86	120	30.7
10SEP86	120	30.3
11SEP86	0	28.1
11SEP86	0	28.7
11SEP86	60	27.2
11SEP86	60	27.1
11SEP86	120	30.1
11SEP86	120	30.5
12SEP86	0	28.7
12SEP86	0	28.9
12SEP86	60	27.3
12SEP86	60	27.1
12SEP86	120	31.0
12SEP86	120	29.9
13SEP86	0	28.2
13SEP86	0	28.4
13SEP86	60	27.0
13SEP86	60	27.0
13SEP86	120	29.0

DEPTH-113 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
13SEP86	120	29.3
14SEP86	0	28.3
14SEP86	0	28.4
14SEP86	60	26.6
14SEP86	60	26.1
14SEP86	120	25.2
14SEP86	120	23.9
15SEP86	0	26.6
15SEP86	0	25.7
15SEP86	60	24.6
15SEP86	60	27.5
15SEP86	120	22.5
15SEP86	120	21.7
16SEP86	0	24.1
16SEP86	0	23.8
16SEP86	60	22.5
16SEP86	60	22.2
16SEP86	120	21.2
16SEP86	120	20.9

TABLE C.3

Volumetric Moisture Content at the 188-cm Depth

DEPTH-188 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
03JUN86	0	17.7
03JUN86	60	16.6
03JUN86	120	14.4
04JUN86	0	18.3
04JUN86	60	17.0
04JUN86	120	14.7
12JUN86	0	18.1
12JUN86	60	17.4
12JUN86	120	15.4
19JUN86	0	19.3
19JUN86	60	18.3
19JUN86	120	16.7
01JUL86	0	32.5
01JUL86	60	29.7
01JUL86	120	34.0
07JUL86	0	31.2
07JUL86	60	29.5
07JUL86	120	34.4
23JUL86	0	31.7
23JUL86	60	29.7
23JUL86	120	35.0
29JUL86	0	31.3
29JUL86	10	30.4
29JUL86	20	29.8
29JUL86	30	30.2
29JUL86	40	29.8
29JUL86	50	29.5
29JUL86	60	30.0
29JUL86	70	30.1
29JUL86	80	30.6
29JUL86	90	31.7
29JUL86	100	32.2
29JUL86	110	33.7
29JUL86	120	36.2
31JUL86	0	31.9
31JUL86	10	30.3
31JUL86	20	30.1
31JUL86	30	29.6
31JUL86	40	30.0
31JUL86	50	29.9
31JUL86	60	30.0
31JUL86	70	30.5
31JUL86	80	30.9
31JUL86	90	30.9
31JUL86	100	32.1

DEPTH-188 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
31JUL86	110	33.6
31JUL86	120	35.5
05AUG86	0	32.1
05AUG86	0	32.1
05AUG86	10	30.4
05AUG86	20	30.1
05AUG86	30	30.6
05AUG86	40	30.1
05AUG86	50	30.1
05AUG86	60	29.7
05AUG86	60	30.4
05AUG86	70	30.1
05AUG86	80	30.4
05AUG86	90	31.1
05AUG86	100	32.1
05AUG86	110	33.7
05AUG86	120	35.8
05AUG86	120	30.1
05AUG86	180	30.6
05AUG86	240	30.1
05AUG86	300	30.1
05AUG86	360	29.7
05AUG86	420	30.1
05AUG86	480	30.4
05AUG86	540	31.1
05AUG86	600	32.1
05AUG86	660	33.7
05AUG86	720	35.8
12AUG86	0	31.9
12AUG86	0	31.9
12AUG86	60	30.2
12AUG86	60	30.2
12AUG86	120	35.9
12AUG86	120	35.9
20AUG86	0	31.6
20AUG86	0	31.6
20AUG86	60	30.0
20AUG86	60	30.0
20AUG86	120	36.0
20AUG86	120	36.0
28AUG86	0	31.7
28AUG86	0	31.7
28AUG86	0	31.7
28AUG86	60	29.9
28AUG86	60	29.9

DEPTH-188 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
28AUG86	60	29.9
28AUG86	120	35.3
28AUG86	120	35.3
28AUG86	120	35.3
03SEP86	0	30.7
03SEP86	60	29.2
03SEP86	120	28.3
04SEP86	0	31.1
04SEP86	60	29.6
04SEP86	120	34.7
05SEP86	0	30.8
05SEP86	60	28.7
05SEP86	120	29.8
06SEP86	0	31.1
06SEP86	60	29.2
06SEP86	120	17.3
08SEP86	0	30.8
08SEP86	60	28.8
08SEP86	120	35.3
09SEP86	0	29.0
09SEP86	60	27.5
09SEP86	120	33.1
10SEP86	0	28.9
10SEP86	0	28.1
10SEP86	60	26.8
10SEP86	60	26.6
10SEP86	120	32.8
10SEP86	120	32.8
11SEP86	0	29.0
11SEP86	0	28.6
11SEP86	60	27.1
11SEP86	60	26.7
11SEP86	120	32.9
11SEP86	120	32.5
12SEP86	0	28.9
12SEP86	0	28.6
12SEP86	60	26.9
12SEP86	60	26.9
12SEP86	120	33.3
12SEP86	120	31.7
13SEP86	0	28.5
13SEP86	0	28.3
13SEP86	60	26.9
13SEP86	60	27.3
13SEP86	120	33.0

DEPTH-188 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
13SEP86	120	33.0
14SEP86	0	28.6
14SEP86	0	28.3
14SEP86	60	26.7
14SEP86	60	27.0
14SEP86	120	33.0
14SEP86	120	33.4
15SEP86	0	28.2
15SEP86	0	28.3
15SEP86	60	27.0
15SEP86	60	26.5
15SEP86	120	31.7
16SEP86	0	28.3
16SEP86	0	28.1
16SEP86	60	26.7
16SEP86	60	26.3
16SEP86	120	30.7
16SEP86	120	30.9

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TABLE C.4

Volumetric Moisture Content at the 264-cm Depth

DEPTH-264 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
03JUN86	0	18.3
03JUN86	60	17.6
03JUN86	120	14.5
04JUN86	0	19.0
04JUN86	60	18.1
04JUN86	120	14.8
12JUN86	0	19.5
12JUN86	60	18.6
12JUN86	120	15.8
19JUN86	0	28.7
19JUN86	60	27.3
19JUN86	120	30.9
01JUL86	0	30.3
01JUL86	60	28.7
01JUL86	120	30.7
07JUL86	0	30.1
07JUL86	60	28.5
07JUL86	120	31.6
23JUL86	0	30.6
23JUL86	60	28.6
23JUL86	120	31.7
29JUL86	0	30.8
29JUL86	10	28.9
29JUL86	20	29.0
29JUL86	30	29.1
29JUL86	40	29.3
29JUL86	50	28.6
29JUL86	60	29.0
29JUL86	70	28.6
29JUL86	80	28.9
29JUL86	90	29.2
29JUL86	100	30.0
29JUL86	110	31.1
29JUL86	120	32.0
31JUL86	0	30.7
31JUL86	10	28.6
31JUL86	20	28.5
31JUL86	30	28.9
31JUL86	40	28.7
31JUL86	50	29.0
31JUL86	60	28.6
31JUL86	70	28.5
31JUL86	80	28.6
31JUL86	90	29.3
31JUL86	100	30.1

DEPTH-264 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
31JUL86	110	31.0
31JUL86	120	32.5
05AUG86	0	30.8
05AUG86	0	30.8
05AUG86	10	29.1
05AUG86	20	29.1
05AUG86	30	29.1
05AUG86	40	28.6
05AUG86	50	28.6
05AUG86	60	28.4
05AUG86	60	29.1
05AUG86	70	28.7
05AUG86	80	28.8
05AUG86	90	29.6
05AUG86	100	29.8
05AUG86	110	31.2
05AUG86	120	32.3
05AUG86	120	29.1
05AUG86	180	29.1
05AUG86	240	28.6
05AUG86	300	28.6
05AUG86	360	28.4
05AUG86	420	28.7
05AUG86	480	28.8
05AUG86	540	29.6
05AUG86	600	29.8
05AUG86	660	31.2
05AUG86	720	32.3
12AUG86	0	30.4
12AUG86	0	30.4
12AUG86	60	28.8
12AUG86	60	28.8
12AUG86	120	32.5
12AUG86	120	32.5
20AUG86	0	30.8
20AUG86	0	30.8
20AUG86	60	29.1
20AUG86	60	29.1
20AUG86	120	32.9
20AUG86	120	32.9
28AUG86	0	30.5
28AUG86	0	30.5
28AUG86	0	30.5
28AUG86	60	28.9
28AUG86	60	28.9

DEPTH-264 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
28AUG86	60	28.9
28AUG86	120	32.2
28AUG86	120	32.2
28AUG86	120	32.2
03SEP86	0	29.3
03SEP86	60	27.6
03SEP86	120	31.4
04SEP86	0	29.4
04SEP86	60	27.7
04SEP86	120	31.4
05SEP86	0	29.7
05SEP86	60	27.9
05SEP86	120	30.9
06SEP86	0	29.7
06SEP86	60	27.5
06SEP86	120	31.5
08SEP86	0	29.7
08SEP86	60	27.4
08SEP86	120	31.3
09SEP86	0	27.7
09SEP86	60	25.9
09SEP86	120	29.8
10SEP86	0	27.3
10SEP86	0	27.1
10SEP86	60	25.9
10SEP86	60	26.3
10SEP86	120	29.5
10SEP86	120	29.6
11SEP86	0	27.1
11SEP86	0	27.4
11SEP86	60	25.8
11SEP86	60	25.9
11SEP86	120	29.2
11SEP86	120	29.1
12SEP86	0	27.4
12SEP86	0	27.6
12SEP86	60	25.7
12SEP86	60	26.0
12SEP86	120	29.4
12SEP86	120	30.1
13SEP86	0	27.4
13SEP86	0	27.4
13SEP86	60	25.8
13SEP86	60	27.1
13SEP86	120	29.4

DEPTH-264 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
13SEP86	120	29.4
14SEP86	0	27.3
14SEP86	0	27.3
14SEP86	60	26.0
14SEP86	60	26.0
14SEP86	120	30.1
15SEP86	0	27.1
15SEP86	0	27.0
15SEP86	60	25.7
15SEP86	60	26.1
15SEP86	120	29.6
15SEP86	120	28.7
16SEP86	0	27.1
16SEP86	0	27.1
16SEP86	60	25.7
16SEP86	60	25.5
16SEP86	120	29.0
16SEP86	120	29.0

TABLE C.5

Volumetric Moisture Content at the 339-cm Depth

DEPTH-339 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
03JUN86	0	19.4
03JUN86	60	19.2
03JUN86	120	13.3
04JUN86	0	20.1
04JUN86	60	20.2
04JUN86	120	18.2
12JUN86	0	24.6
12JUN86	60	22.5
12JUN86	120	22.3
19JUN86	0	32.2
19JUN86	60	27.6
19JUN86	120	29.9
01JUL86	0	33.3
01JUL86	60	28.1
01JUL86	120	30.5
07JUL86	0	32.7
07JUL86	60	28.1
07JUL86	120	30.5
23JUL86	0	32.8
23JUL86	60	28.5
23JUL86	120	30.8
29JUL86	0	32.9
29JUL86	10	31.3
29JUL86	20	31.1
29JUL86	30	29.9
29JUL86	40	29.3
29JUL86	50	29.3
29JUL86	60	28.8
29JUL86	70	28.1
29JUL86	80	28.3
29JUL86	90	28.9
29JUL86	100	29.5
29JUL86	110	30.4
29JUL86	120	31.0
31JUL86	0	32.7
31JUL86	10	31.3
31JUL86	20	30.3
31JUL86	30	29.9
31JUL86	40	29.6
31JUL86	50	29.0
31JUL86	60	28.1
31JUL86	70	28.3
31JUL86	80	28.3
31JUL86	90	28.6
31JUL86	100	29.5

DEPTH-339 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
31JUL86	110	30.2
31JUL86	120	30.9
05AUG86	0	32.9
05AUG86	0	32.9
05AUG86	10	31.4
05AUG86	20	31.1
05AUG86	30	29.9
05AUG86	40	29.5
05AUG86	50	29.1
05AUG86	60	28.9
05AUG86	60	31.4
05AUG86	70	28.5
05AUG86	80	28.4
05AUG86	90	28.7
05AUG86	100	29.2
05AUG86	110	30.0
05AUG86	120	30.5
05AUG86	120	31.1
05AUG86	180	29.9
05AUG86	240	29.5
05AUG86	300	29.1
05AUG86	360	28.9
05AUG86	420	28.5
05AUG86	480	28.4
05AUG86	540	28.7
05AUG86	600	29.2
05AUG86	660	30.0
05AUG86	720	30.5
12AUG86	0	33.2
12AUG86	0	33.2
12AUG86	60	28.4
12AUG86	60	28.4
12AUG86	120	31.0
12AUG86	120	31.0
20AUG86	0	33.3
20AUG86	0	33.3
20AUG86	60	28.5
20AUG86	60	28.5
20AUG86	120	30.8
20AUG86	120	30.8
28AUG86	0	32.9
28AUG86	0	32.9
28AUG86	0	32.9
28AUG86	60	28.5
28AUG86	60	28.5

DEPTH-339 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
28AUG86	60	28.5
28AUG86	120	24.9
28AUG86	120	24.9
28AUG86	120	24.9
03SEP86	0	32.3
03SEP86	60	27.5
03SEP86	120	29.8
04SEP86	0	32.0
04SEP86	60	27.6
04SEP86	120	29.8
05SEP86	0	32.2
05SEP86	60	27.2
05SEP86	120	29.9
06SEP86	0	32.2
06SEP86	60	27.3
06SEP86	120	29.5
09SEP86	0	30.7
09SEP86	60	25.9
09SEP86	120	28.0
10SEP86	0	30.4
10SEP86	0	29.7
10SEP86	60	25.3
10SEP86	60	25.3
10SEP86	120	27.8
10SEP86	120	27.9
11SEP86	0	29.9
11SEP86	0	29.7
11SEP86	60	25.5
11SEP86	60	25.3
11SEP86	120	27.6
11SEP86	120	27.7
12SEP86	0	30.0
12SEP86	0	30.1
12SEP86	60	25.7
12SEP86	60	25.9
12SEP86	120	27.9
12SEP86	120	27.9
13SEP86	0	29.6
13SEP86	0	30.3
13SEP86	60	25.4
13SEP86	60	25.4
13SEP86	120	28.5
13SEP86	120	27.9
14SEP86	0	29.9
14SEP86	0	29.9

DEPTH-339 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
14SEP86	60	25.7
14SEP86	60	25.4
14SEP86	120	27.9
14SEP86	120	27.9
15SEP86	0	29.7
15SEP86	0	30.4
15SEP86	60	25.4
15SEP86	60	25.4
15SEP86	120	27.6
15SEP86	120	27.4
16SEP86	0	30.4
16SEP86	0	29.4
16SEP86	60	25.4
16SEP86	60	25.6
16SEP86	120	27.3
16SEP86	120	27.2

TABLE C.6

Volumetric Moisture Content at the 415-cm Depth

DEPTH=415 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
03JUN86	0	22.4
03JUN86	60	21.3
03JUN86	120	17.9
04JUN86	0	23.2
04JUN86	60	22.0
04JUN86	120	18.8
12JUN86	0	31.3
12JUN86	60	29.0
12JUN86	120	32.2
19JUN86	0	31.8
19JUN86	60	29.7
19JUN86	120	32.5
01JUL86	0	32.4
01JUL86	60	30.7
01JUL86	120	33.3
07JUL86	0	32.8
07JUL86	60	30.3
07JUL86	120	33.8
23JUL86	0	32.8
23JUL86	60	30.1
23JUL86	120	33.7
29JUL86	0	33.0
29JUL86	10	30.6
29JUL86	20	30.1
29JUL86	30	29.8
29JUL86	40	29.9
29JUL86	50	30.0
29JUL86	60	30.6
29JUL86	70	31.1
29JUL86	80	30.7
29JUL86	90	30.5
29JUL86	100	30.4
29JUL86	110	32.2
29JUL86	120	34.0
31JUL86	0	33.5
31JUL86	10	30.1
31JUL86	20	30.2
31JUL86	30	30.1
31JUL86	40	29.8
31JUL86	50	30.0
31JUL86	60	30.5
31JUL86	70	30.4
31JUL86	80	30.8
31JUL86	90	30.5
31JUL86	100	31.4

DEPTH-415 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
31JUL86	110	31.9
31JUL86	120	34.2
05AUG86	0	32.9
05AUG86	0	32.9
05AUG86	10	30.8
05AUG86	20	30.4
05AUG86	30	29.9
05AUG86	40	30.1
05AUG86	50	29.8
05AUG86	60	30.3
05AUG86	60	30.8
05AUG86	70	30.6
05AUG86	80	30.9
05AUG86	90	30.9
05AUG86	100	31.0
05AUG86	110	31.9
05AUG86	120	34.1
05AUG86	120	30.4
05AUG86	180	29.9
05AUG86	240	30.1
05AUG86	300	29.8
05AUG86	360	30.3
05AUG86	420	30.6
05AUG86	480	30.9
05AUG86	540	30.9
05AUG86	600	31.0
05AUG86	660	31.9
05AUG86	720	34.1
12AUG86	0	32.9
12AUG86	0	32.9
12AUG86	60	30.2
12AUG86	60	30.2
12AUG86	120	33.5
12AUG86	120	33.5
20AUG86	0	30.8
20AUG86	0	30.8
20AUG86	60	30.6
20AUG86	60	30.6
20AUG86	120	33.6
20AUG86	120	33.6
28AUG86	0	33.0
28AUG86	0	33.0
28AUG86	0	33.0
28AUG86	60	30.1
28AUG86	60	30.1

DEPTH-415 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
28AUG86	60	30.1
28AUG86	120	33.3
28AUG86	120	33.3
28AUG86	120	33.3
03SEP86	0	31.4
03SEP86	60	29.2
03SEP86	120	32.9
04SEP86	0	31.7
04SEP86	60	29.5
04SEP86	120	32.8
05SEP86	0	31.9
05SEP86	60	29.3
05SEP86	120	17.9
06SEP86	0	32.0
06SEP86	60	29.7
06SEP86	120	32.3
09SEP86	0	29.9
09SEP86	60	27.6
09SEP86	120	31.2
10SEP86	0	30.2
10SEP86	0	29.9
10SEP86	60	27.2
10SEP86	60	27.5
10SEP86	120	30.5
10SEP86	120	30.9
11SEP86	0	29.5
11SEP86	0	29.6
11SEP86	60	27.2
11SEP86	60	27.4
11SEP86	120	31.2
11SEP86	120	30.3
12SEP86	0	29.6
12SEP86	0	29.7
12SEP86	60	27.5
12SEP86	60	27.6
12SEP86	120	31.3
12SEP86	120	30.4
13SEP86	0	30.1
13SEP86	0	30.0
13SEP86	60	27.4
13SEP86	60	27.5
13SEP86	120	30.5
13SEP86	120	31.4
14SEP86	0	29.5
14SEP86	0	29.7

DEPTH=415 cm Horizontal Tube

Sampling Date	Distance From Center (cm)	Volumetric Moisture Content (%)
14SEP86	60	27.8
14SEP86	60	27.4
14SEP86	120	31.5
14SEP86	120	31.3
15SEP86	0	29.5
15SEP86	0	29.5
15SEP86	60	27.6
15SEP86	60	25.9
15SEP86	120	30.9
15SEP86	120	29.9
16SEP86	0	29.7
16SEP86	0	29.6
16SEP86	60	27.0
16SEP86	60	27.2
16SEP86	120	29.8
16SEP86	120	29.7

NRC FORM 336 (2-84) NRCM 1102, 3201, 3202 SEE INSTRUCTIONS ON THE REVERSE		U.S. NUCLEAR REGULATORY COMMISSION		1 REPORT NUMBER (Assigned by TIDC, add Vol. No., if any) NUREG/CR-4901 LA-10981-MS	
2 TITLE AND SUBTITLE Effects from Influent Boundary Conditions on Tracer Migration and Spatial Variability Features in Intermediate-Scale Experiments			3 LEAVE BLANK		
5 AUTHOR(S) H. R. Fuentes, W. L. Polzer, and E. P. Springer			4 DATE REPORT COMPLETED MONTH: March YEAR: 1987		
7 PERFORMING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code) Los Alamos National Laboratory Los Alamos, NM 87545			6 DATE REPORT ISSUED MONTH: April YEAR: 1987		
10 SPONSORING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code) Division of Waste Management Office of Nuclear Materials Safety and Safeguards U.S. Nuclear Regulatory Commission Washington, DC			8 PROJECT/TASK/WORK UNIT NUMBER 9 FIN OR GRANT NUMBER A7150		
12 SUPPLEMENTARY NOTES			11a TYPE OF REPORT Technical		
13 ABSTRACT (200 words or less) In previous unsaturated transport studies at Los Alamos dispersion coefficients were estimated to be higher close to the tracer source than at greater distances from the source. Injection of tracers through discrete influent outlets could have accounted for those higher dispersions. Also, a lack of conservation of mass of the tracers was observed and suspected to be due to spatial variability in transport. In the present study experiments were performed under uniform influent (ponded) conditions in which breakthrough of tracers was monitored at four locations at each of four depths. All other conditions were similar to those of the unsaturated transport experiments. A comparison of results from these two sets of experiments indicates differences in the parameter estimates. Estimates were made for the dispersion coefficient and the retardation factor by the one-dimensional steady flow computer code, CFITIM. Estimates were also made for mass and for velocity and the dispersion coefficient by the method of moments. The dispersion coefficient decreased with depth under discrete influent application and increased with depth under ponded influent application. Differences in breakthroughs and in estimated parameters among locations at the same depth were observed under ponded influent application. Those differences indicate that there is a lack of conservation of mass as well as significant spatial variability across the experimental domain.			b PERIOD COVERED (Inclusive dates)		
14 DOCUMENT ANALYSIS - a KEYWORDS/DESCRIPTORS Influent boundary conditions (discrete versus ponded) Tracer migration (dispersion coefficients, retardation factors) Spatial Variability of tracer migration Intermediate-Scale Experiments				15 AVAILABILITY STATEMENT Unlimited	
b IDENTIFIERS/OPEN-ENDED TERMS				16 SECURITY CLASSIFICATION (This page) Unclassified (This report) Unclassified	
				17 NUMBER OF PAGES	
				18 PRICE	